

# EARLY BYZANTINE PHARMACOLOGY

JOHN SCARBOROUGH

## INTRODUCTION

The study of Byzantine drug lore presents the modern scholar with several problems. At first glance, it would appear that Oribasius, Aetius of Amida, Alexander of Tralles, and Paul of Aegina have simply replicated data and nomenclature found in the works of Dioscorides, Galen, and other earlier Greek and Roman accounts of herbs and herbals, medicinal minerals, and animal products employed in the manufacture of drugs. Yet when one investigates carefully the Greek texts of all four of these major so-called compilers in the history of early Byzantine medicine, one soon discovers that there are indeed duplications from Greco-Roman authorities in consideration of drugs and drug lore, but that the theory of drug-action has shifted in an important manner, and also that substances used in pharmacy have been augmented, both in number and in kind. This new theory of pharmacology, based firmly upon scattered statements from a wide range of Galenic writings, can be nicely illustrated with the lengthy prologue by Aetius of Amida to his *Medical Books* (the *Tetrabiblon*).<sup>1</sup> Moreover, when one compares "borrowing" by Oribasius, Aetius, Alexander, and Paul, from Galen and earlier authorities, one discerns significant variations in syntax and, most importantly, a clear consideration of medicinal substances in their own right, rather far removed from the copyist epithet often given to these early Byzantine medical writers. Oribasius and Alexander, in particular, submit drug recipes that show a command of the ancient texts and personal experience with pharmaceuticals.

We are also fortunate in being able to link the allegedly formal aspects of early Byzantine drug lore with data that the non-physician might know—

at least in late Roman and Byzantine Egypt. Many papyri, especially those contained in the collection called the *Papyri Graeci Magicae*,<sup>2</sup> show how drugs and pharmaceuticals were used in numerous non-medical contexts, but of great importance among these papyrological citations is the assumption of common knowledge of the *kyphi* and *krisma* recipes, also significant in the formal works by Byzantine physicians on pharmacology. Early Byzantine pharmacy drew upon classical heritages—from the Hippocratics through Galen—but it also shows a clear development of its own, seen best in a reworked drug theory and in the augmentation of particular substances employed as pharmaceuticals. This sophisticated pharmacy is also paralleled in the papyri,<sup>3</sup> but these documents are, of course, shorn of theory, which may or may not have penetrated into the ranks of Egyptian priests, soothsayers, and purported experts in magic.<sup>4</sup>

## THE HISTORICAL BACKGROUND OF GREEK AND ROMAN PHARMACY TO GALEN

Drug lore is the first aspect of Greek medicine that can be documented, since spices and presumed pharmaceuticals turn up in the Linear B tablets of Mycenaean Greece and Crete.<sup>5</sup> After the

<sup>2</sup> See esp. *PGM*, IV, 2307–9; XII, 401–45; XXXVI, 322–32.

<sup>3</sup> Marie-Hélène Marganne, *Inventaire analytique des papyrus grecs de médecine* (Geneva, 1981). Magical papyri are excluded.

<sup>4</sup> E.g., *PGM*, XII, 401–45. Cf. H. Harrauer and P. J. Sijpestein, *Medizinische Rezepte und Verwandtes* (Vienna, 1981); K. Sudhoff, *Ärztliches aus griechischen Papyrus-Urkunden* (Leipzig, 1909); H. I. Bell, A. D. Nock, and H. Thompson, *Magical Texts from a Bilingual Papyrus in the British Museum* (London, 1931 [Proceedings of the British Academy, Vol. XVII]). Unfortunately, the rich lore and medical equivalencies in E. A. E. Reymond, *From the Contents of the Libraries of the Suchos Temples in the Fayyum*, Part I: *A Medical Book from Crocodilopolis P. Vindob. D. 6257* (Vienna, 1976), cannot be trusted. A new edition with translation and commentary of P. Vindobonensis D. 6257 is in preparation at the Oriental Institute of the University of Chicago.

<sup>5</sup> See esp. L. R. Palmer, *Interpretation of Mycenaean Greek Texts* (Oxford, 1963), Nos. 163–168 [pp. 269–73], and J. Chadwick, *Documents in Mycenaean Greek*, 2nd ed. (Cambridge, 1973), Nos.

[The reader is referred to the list of abbreviations at the end of the volume.]

<sup>1</sup> Aetius I *prooemium* (ed. Olivieri [CMG VIII 1], pp. 17–30).

passing of the Mycenaeans, there is good indication of a common knowledge of *pharmaka* (at least those that were involved in application of simples for minor wounds, and those that were deemed potent in spells and incantations) in Homer's epics,<sup>6</sup> so that drug lore probably flourished among the Greeks of the Homeric Age, much as it would later.<sup>7</sup> Lyric poetry has left us with some isolated mentions of drugs and salves,<sup>8</sup> and there is firm evidence that certain drugs were well known among the Greeks in the fifth century B.C., suggested by puns in Aristophanes and other non-medical writers.<sup>9</sup> It is not until the fifth and fourth centuries B.C. that a separate study of medical plants was made a part of formal medical practice, and the Pseudo-Aristotelian *Problems* probably mirror the same sources for drugs and drug theory that appear also in several books of the Hippocratic *corpus*.<sup>10</sup> Diocles of Carystos (a contemporary of Aristotle)<sup>11</sup> studied plants for their pharmaceutical properties, and the study of botany received a canonical form in Theophrastus' *Historia plantarum* and *De causis plantarum* (both c. 300 B.C.);<sup>12</sup> Book IX of *Historia plantarum* is our first extant herbal in Greek.<sup>13</sup>

103, 105, and 107 [pp. 224, 228, and 231]. A few, scattered studies have begun to appear on these texts and similar ones, e.g., Anna Sacconi, "La mirra nella preparazione degli unguenti profumati a Cnosso," *Athenaeum*, n.s. 47 (1969), 281–89; C. P. W. Warren, "Some Aspects of Medicine in the Greek Bronze Age," *Medical History*, 14 (1970), 364–77; and R. Janko, "Un 1314: Herbal Remedies at Pylos," *Minos*, 17 (1981), 30–34.

<sup>6</sup>E.g., Homer, *Odyssey* X, 304–6, 316–17, and 391–94, among many references.

<sup>7</sup>Cf. Homer, *Iliad* VIII, 306–8, with Dioscorides IV, 64.1 (ed. Wellmann, II, p. 218).

<sup>8</sup>When Sappho, Frg. 96 (var. eds., trans. D. A. Campbell, *Greek Lyric*, I [Cambridge, Mass., 1982], p. 120 [Loeb]), writes "the dew is shed in beauty, and roses bloom and tender chervil and flowery melilot," one immediately perceives a long-lived close acquaintance with herbs and flowers. Sappho, Frgs. 105, 143, 189, and 210 (Campbell, pp. 132, 156, 180 and 192) mention hyacinth, chick peas, nitrum, and fustic. Cf. Theognis 537 and 1193 (squill and spiny broom); Simonides 10 (myrtle); Hesiod, *Works* 41 (asphodel), etc., among many references.

<sup>9</sup>E.g., Aristophanes, *Lysistrata* 89, and *Peace* 712 (puns on the uses of the pennyroyal [*Mentha pulegium* L.]). Discussion in Scarborough, "Nicander II," 74–75 with nn. 239–54.

<sup>10</sup>J. Scarborough, "Theoretical Assumptions in Hippocratic Pharmacology," in F. Lasserre and P. Mudry, eds., *Formes de pensée dans la collection hippocratique: Actes du IV<sup>e</sup> Colloque international hippocratique (Lausanne . . . 1981)* (Geneva, 1983), 307–25.

<sup>11</sup>W. Jaeger, *Diokles von Karystos*, 2nd ed. (Berlin, 1963), 186–236. The fairly extensive fragments of Diocles' writings are collected in M. Wellmann, ed., *Die Fragmente der sikelischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin, 1901), 117–207.

<sup>12</sup>F. Egerton, ed., *Edward Lee Greene: Landmarks of Botanical History* (Stanford, California, 1983; 2 vols.), I, 128–211.

<sup>13</sup>J. Scarborough, "Theophrastus on Herbals and Herbal Remedies," *JHB*, 11 (1978), 353–85.

Theophrastus carefully classifies plants by their leaves, roots, seeds, stems, and growing season, and the methodologies of his master, Aristotle, show brilliantly in the taxonomy and morphology.<sup>14</sup>

Although there is good evidence for the study of pharmacy in the Hellenistic era, our available texts for the period consist of fragmentary remains of the drug lore of Apollodorus (*fl.* c. 250 B.C.),<sup>15</sup> and such notables as Herophilus and Erasistratus (both *fl.* 270–260 B.C.),<sup>16</sup> as well as the two poems on toxicology by Nicander of Colophon (*fl.* c. 130 B.C.) called *Theriaca* and *Alexipharmaca*.<sup>17</sup> Nicander stole his data from the lost works of Apollodorus, who had made a detailed study of toxic substances, poisonous snakes, scorpions, spiders, and insects,<sup>18</sup> apparently in the manner of Peripatetic natural history,<sup>19</sup> but it would be Nicander's obtuse poems that became standard "textbooks" in toxicology, employed by almost all medical authorities from his own time through the European Renaissance.<sup>20</sup>

Theophrastus struggled with the problem of how drugs were to be classified, and he provides an extremely muddled system in *Historia plantarum* IX.<sup>21</sup> Much of his data is derived from a professional class of *rhizotomoi*, whose firsthand experience Theophrastus records in several instances.<sup>22</sup> Yet the definition of *poa* ("herb") remains hopelessly vague, since Theophrastus' overriding methodology demanded first attention to morphology and taxonomy, not to the medical properties of any particular plant or drug made from a plant. A foggy notion

<sup>14</sup>Egerton, ed., *Greene* (n. 12 above), I, 169–89. O. Regenbogen, "Theophrastos," *RE*, Supplementband VII (Stuttgart, 1940), cols. 1354–1562, esp. 1435–79 (botany).

<sup>15</sup>M. Wellmann, "Apollodorus (69)," *RE*, Vol. I, part 2 (Stuttgart, 1894), col. 2895, and (same author), "Das älteste Kräuterbuch der Griechen," in *Festgabe für Franz Susemihl* (Leipzig, 1898), 1–31. J. Scarborough, "Nicander's Toxicology, I: Snakes," *PH*, 19 (1977), 3–23 (3–4, with nn. 8–19).

<sup>16</sup>P. M. Fraser, *Ptolemaic Alexandria* (Oxford, 1972; 3 vols.), I, 353, and II, 519 n. 116, and 627 n. 472 [Herophilus]. R. Fuchs, "Eine neue Rezeptformel des Erasistratos," *Hermes*, 33 (1898), 342–44.

<sup>17</sup>Nicander (ed. and trans. Gow and Scholfield) is the best edition available, with a translation quite often based on shrewd guesswork—openly admitted by the editors.

<sup>18</sup>Scarborough, "Nicander's Snakes" (n. 15 above), 3–4, and (same author), "Nicander II" *passim*.

<sup>19</sup>Scarborough, "Nicander II," 5–6. Wellmann, "Kräuterbuch" (n. 15 above), 28.

<sup>20</sup>E.g., a late Greek manuscript (Bologna, Bibl. Univ. Codex 3632, esp. fol. 417) of the late fifteenth or early sixteenth century. Scarborough, "Nicander II," 4, with nn. 4–8.

<sup>21</sup>Egerton, ed., *Greene* (n. 12 above), I, 180–81. Scarborough, "Theophrastus" (n. 13 above), 356–57.

<sup>22</sup>Theophrastus, *HP* IX, 8 *passim*; 11.7 and 9; 15.2; 16.3; 18.3 and 10; and 20.4.

of toxicology does appear in Book IX of *Historia plantarum*,<sup>23</sup> but Theophrastus and his sources seem unaware of a basic theory that would explain the differences among drugs. Some hints of an embryonic theory of toxicology do, indeed, appear in the Pseudo-Aristotelian *Problems*, as well as certain tracts of the Hippocratic *corpus*, but there is more of an attempt to collect data than to propose a logical and careful hypothesis about how and why drugs "work" as they do. Nicander's poems also reflect this attention to the collection of details, and the lack of a cohesive theory to link them together, and the fragments of other Hellenistic pharmacologists likewise suggest a haphazard and often erroneous set of prescriptions, or—in the cases of Herophilus and Erasistratus—an attempt to set down specific treatments for particular ailments, in the classic manner of the Hippocratic writers.

Dioscorides of Anazarbus (fl. c. A.D. 65) attempted to change the chaos of pharmacology into an ordered system.<sup>24</sup> He seems to have invented a "drug affinity" methodology for the study of pharmaceuticals, quite similar to the modern concepts underlying pharmacognosy, but this non-alphabetical, non-humoral theory demanded precise observation of plants in their varying growing seasons as well as extreme accuracy in the physician's observations concerning which drugs were useful against which specific ailments and diseases. Dioscorides' *Materia medica* certainly became a classic handbook, quoted by almost all later writers on pharmacy (both Greek and Latin, as well as Arabic) for nearly 1800 years.<sup>25</sup> He includes nearly 600 species of plants in the *Materia medica*,<sup>26</sup> compared with approximately 450 species in the Hippocratic *corpus*,<sup>27</sup> the 550 species recorded by Theophrastus,<sup>28</sup> and the 300 plant names given by Nicander.<sup>29</sup> Dioscorides' listings encompass many drugs introduced into Greco-Roman pharmacy from the

Far East,<sup>30</sup> showing the expansion of trade and geographic knowledge in the Hellenistic era and in the first decades of Roman imperial rule in the eastern Mediterranean.<sup>31</sup> His rejection, however, of both the poetic form of relating knowledge of drugs (illustrated by the difficult hexameters of Nicander) and also the apparently standard manner of listing simples in alphabetical order,<sup>32</sup> led in turn to the discarding of Dioscorides' classification system by later pharmacologists, including the chalcenic Galen.<sup>33</sup> Dioscorides' drug lore tapped not only the formal sources of pharmacology, as they might be found in earlier written records, but also folk medicine, acknowledged from time to time in the *Materia medica*.<sup>34</sup> Moreover, he insists that the would-be pharmacologist has to know his plants, not from book-learning, but by patient and lengthy observation of herb growth as they changed form, shape, and color through differing seasons in various geographic locations as he knew them generally in the eastern Mediterranean littoral.<sup>35</sup> Added to the demand of painstaking observation of reaction to drugs by actual patients, these two requirements by Dioscorides soon led to modifications, including a return to alphabetical listings and pharmaceutical poetry.<sup>36</sup> While respecting Dioscorides for his obvious learning and meticulous attention to botanical details, Galen rejected the "drug affinity" system, while retaining (at least he says he does) Dioscorides' admonition to know the plants from personal experience. And it would be Galen, not Dioscorides, who would provide the beginning models for Byzantine drug lore.

#### GALEN'S PHARMACY

Galen of Pergamon (A.D. 129-prob. 210) looms as one of the most influential writers in the entire history of medicine.<sup>37</sup> His summary of all aspects

<sup>23</sup>Theophrastus, *HP* IX, 16.4–7. Scarborough, "Theophrastus" (n. 13 above), 376–77 with nn. 131–35.

<sup>24</sup>Scarborough and Nutton, "Preface," 189–90. J. M. Riddle, "Dioscorides," *DSB*, Vol. IV (New York, 1971), 119–23. Riddle's *Dioscorides* (Austin, Texas [in press]) explicates in brilliant detail Dioscorides' "drug affinity" system.

<sup>25</sup>J. M. Riddle, "Dioscorides" in *Catalogus* IV, 1–143. Scarborough and Nutton, "Preface," 187–88.

<sup>26</sup>J. Stannard, "Byzantine Botanical Lexicography," *Episteme*, 5 (1971), 168–87 [171].

<sup>27</sup>My "count" differs sharply with that of Stannard (*ibid.*), who suggests about 225 spp. [p. 170].

<sup>28</sup>Regenbogen, "Theophrastos" (n. 14 above), col. 1467. Egerton, ed., *Greene* (n. 12 above), I, 96 gives 500 as his "count."

<sup>29</sup>Based on Nicander, ed. and trans. Gow and Scholfield.

<sup>30</sup>E.g., ginger (*Zingiber officinale* Roscoe) among several. J. I. Miller, *The Spice Trade of the Roman Empire* (Oxford, 1969), 53–57.

<sup>31</sup>J. Scarborough, "Roman Pharmacy and the Eastern Drug Trade," *PH*, 24 (1982), 135–43.

<sup>32</sup>Scarborough and Nutton, "Preface," 212–13.

<sup>33</sup>*Ibid.*, 190–91.

<sup>34</sup>*Ibid.*, 189 with nn. 10 and 13.

<sup>35</sup>Dioscorides, *Preface* 7 (ed. Wellmann, I, p. 4; trans. Scarborough and Nutton, "Preface," 196–97).

<sup>36</sup>E.g. the medical poetry of Damocrates (quoted by Galen) and most of the drug lists by Galen.

<sup>37</sup>The literature on Galen is enormous, but only a few works are based securely on the Greek texts. Recommended are: V. Nutton, "The Chronology of Galen's Early Career," *CQ*, n.s. 23 (1973), 158–71, and [same author], "Galen and Medical Auto-

of medicine and related matters, including philosophy and pharmacology, exerted a heavy sway over physicians and medical commentators well into the nineteenth century,<sup>38</sup> and one may gauge his proximity and learning by the simple task of counting the volumes (20) represented by the Kühn edition of Galen.<sup>39</sup> Since his drug lore influenced later writers, especially in the Byzantine East, so heavily, one necessarily must consider Galen's pharmacology in some detail in order to perceive how early Byzantine drug theory might be similar to and different from the presumed blueprints laid down in several of his treatises which consider pharmaceuticals in particular.

Galen's drug lore is scattered throughout the massive number of works left under his name, but much of his approach to pharmacology, herbs, and treatments through pharmaceuticals is concentrated in *Mixtures and Properties of Simples*,<sup>40</sup> *Compound Drugs Arranged by Location of Ailment*,<sup>41</sup> *Compound Drugs Arranged by Kind*,<sup>42</sup> *Antidotes*,<sup>43</sup> and similar tracts, some of which may be spurious.<sup>44</sup> Galen quotes from dozens of earlier Greek and Roman pharmacologists—including Dioscorides—and although Galen insists one had to know plants and drugs personally,<sup>45</sup> many of the recipes, prescriptions, and treatments are filched from earlier authorities,<sup>46</sup> most often through previous col-

lections of recipes compiled by Andromachus (physician to Nero [A.D. 54–68]), Asclepiades the Pharmacist (prob. fl. c. A.D. 50), and Criton (physician to Trajan [A.D. 98–117]). He includes all of the famous simples, known from the time of Theophrastus, but adds no new herbs to the varieties already known to Dioscorides.

In *Mixtures and Properties of Simples* I–V,<sup>47</sup> Galen sets out in an incredibly verbose fashion his composite theory of drug action, based upon degree of cold and hot, moist and dry, with subtle subclassifications generally measured according to the senses of taste, touch, and smell. Not surprisingly, these 329 Kühn pages will not form the foundation of Byzantine adaptation of Galen's drug theories, as will be suggested below with the consideration of the Preface to Aetius' *Medical Books*. Galen proposes his arguments upon what he says are the "best authorities," and *Simples* I–V is replete with name-dropping of the worthies of the pharmaceutical past, from Diocles, Hippocrates, and Theophrastus, through Dioscorides and Asclepiades. What emerges in this involuted summary is the famous "drugs by degrees" system,<sup>48</sup> which would retain its hold on western pharmacy until the nineteenth century. Only in the beginning of Book VI of *Simples* does Galen speak in specific about drugs, and then only after a Preface to Book VI in which he warns against misleading authorities (for example, Pamphilus)<sup>49</sup> who were not experts in plants, and in which he re-lists the reliable sources (a long list that includes Dioscorides)<sup>50</sup>—but Galen lets us know that none of his predecessors understood drugs as well as he does. Then follows the listing of drugs, beginning with "On Shrubby Wormwood and Absinthe and their Particular Kinds."<sup>51</sup> Unlike the extreme clarity of Dioscorides, we read a muddled catalogue of properties generally based on locale. *Simples* VI, 2<sup>52</sup> is "On Agnus Castus," *Simples* VI, 3 is "On Dog's Tooth Grass" [*agrōstis*],<sup>53</sup> VI, 4 is "The Four Kinds of Alkanet" [*anchousa*],<sup>54</sup> VI, 5 is "The Agaric 'Root'"

biography," *Proceedings of the Cambridge Philological Society*, 18 (1972), 50–62; J. Scarborough, "The Galenic Question," *SA*, 65 (1981), 1–31, and (same author), "Galen and the Gladiators," *Episteme*, 5 (1971), 98–111; J. Ilberg, "Aus Galens Praxis," *Neue Jahrbücher für das klassische Altertum*, 15 (1905), 276–312 (rptd. in H. Flashar, ed., *Antike Medizin* [Darmstadt, 1971], 361–416); J. Mewaldt, "Galenos (2)," *RE*, Vol. VII, part 1 (Stuttgart, 1910), cols. 578–91; F. Kudlien and L. G. Wilson, "Galen," *DSB*, Vol. V (New York, 1972), 227–37; W. D. Smith, *The Hippocratic Tradition* (Ithaca, New York, 1979), 61–176; J. Kollesch, "Galen und die Zweite Sophistik," in Nutton, ed., *Galen: Problems*, 1–12; and—above all—Temkin, *Galenism*, 10–50 ("The Portrait of an Ideal").

<sup>38</sup> Temkin, *Galenism*, 134–92 ("Fall and Afterlife").

<sup>39</sup> The texts of Galen in *CMG* are a small proportion of the works contained in the Kühn ed., which is badly marred by corruptions. To the listing in H. Leitner, *Bibliography to the Ancient Medical Authors* (Bern, 1973), 38–39, can now be added: Nutton, ed., *Galen On Prognosis*; and De Lacy, ed., *Galen On the Doctrines of Hippocrates and Plato*.

<sup>40</sup> Ed. Kühn, XI, 379–892, and XII, 1–377 (in 11 books).

<sup>41</sup> Ed. Kühn, XII, 378–1007, and XIII, 1–361 (in 10 books).

<sup>42</sup> Ed. Kühn, XIII, 362–1058 (in 7 books).

<sup>43</sup> Ed. Kühn, XIV, 1–209 (in 2 books).

<sup>44</sup> *Theriac to Piso* (ed. Kühn, XIV, 210–94 [possible]), *Theriac to Pamphilus* (ed. Kühn, XIV, 295–310 [certainly spurious]), *Easily-Obtained Drugs* (ed. Kühn, XIV, 311–581 in 3 books [certainly spurious]).

<sup>45</sup> Galen, *Mixtures and Properties of Simples* VI, preface (ed. Kühn, XI, 797). Scarborough, *Medicine*, 128–30.

<sup>46</sup> Fabricius, 62–100.

<sup>47</sup> Ed. Kühn, XI, 459–788.

<sup>48</sup> See discussion of Aetius with nn. 149–68 below.

<sup>49</sup> Ed. Kühn, XI, 793–94.

<sup>50</sup> *Ibid.*, 794 and 797.

<sup>51</sup> *Simples* VI, 1 (ed. Kühn, XI, 798–807). Scarborough and Nutton, "Preface," 225–27 (wormwoods).

<sup>52</sup> Cf. Dioscorides I, 103. This is *Vitex agnus-castus* L. (ed. Kühn, XI, 807–10).

<sup>53</sup> Scarborough and Nutton, "Preface," 219 (dog's tooth grass: *Cynodon dactylon* [L.] Pers.). ed. Kühn, XI, 810–11.

<sup>54</sup> Ed. Kühn, XI, 811–13. Cf. Dioscorides IV, 23. This is *Anchousa tinctoria* L.

[*agarikos*],<sup>55</sup> and so on, so that by the end of Book VI of *Simples*, Galen has reached *iota* in what has become an alphabetical listing of simples (all plants) with some properties given according to "heating" and "cooling." Books VII and VIII<sup>56</sup> complete the alphabetical listing of herbs and their properties by their classes of heating and cooling qualities. *Simples* IX, 1.1–4 is "Earths,"<sup>57</sup> IX, 2.1–21 "Stones,"<sup>58</sup> and "Things Mined as Drugs" [*metallika pharmaka*] is *Simples* IX, 3.1–40.<sup>59</sup> Most of these substances are in alphabetical order, with some exceptions suggesting possible corruptions in the Greek texts. *Simples* X is what we would call "animal products," and much as had Dioscorides often prescribed blood for various ailments, so too does Galen extrapolate on this "humor" as a drug along with a number of other materials presumably classed with blood because they emerge from animals; the listing in and of itself is instructive, not so much for what Galen recommended, but for the substances he found listed in his sources (Xenocrates seems to be a major authority).<sup>60</sup> After listing various animal bloods (dove, bat, rabbit, deer, rooster, male goat, lamb, bear, bull, green frog, crocodile and lizard),<sup>61</sup> one reaches a "dairy product" listing (milk, cheese, butter, rennet, seal rennet),<sup>62</sup> followed by biles, perspiration, urine, saliva, and various kinds of animal and bird dungs and manure.<sup>63</sup>

In Book XI of *Simples*, Galen lists other "animal products,"<sup>64</sup> ranging from the flesh of poisonous snakes, marrow, and the liver of a mad dog,<sup>65</sup> to spider webs, blister beetles, cicadas, castor, brains of various animals, eggs, and charred crabs.<sup>66</sup> *Simples*

XI, 2 is a collection of oddments that could be labeled "products of the sea useful in medicinals,"<sup>67</sup> and here are sponges, garum, coral, various sorts of salts and salt products including *asphaltos*.<sup>68</sup> Unlike the herbs and plants of *Simples* VI–VIII, which are given alphabetically, Galen's animal products and sea-medicines seem entered according to another pattern, perhaps ultimately derived from Dioscorides or earlier data found in some of the Hippocratic texts. In sum, Galen lists about 440 different plants in his accounting of herbs in *Simples* I–VIII, and about 250 other substances in the remaining books as useful in making drugs. Indeed, there are caustic remarks concerning the drugs of Xenocrates, especially the varieties of dung, but Galen *does* list them, and one can presume that such materials had long standing in ancient pharmacology, verified by a comparison with medicinals suggested by writers in the Hippocratic *corpus*, Dioscorides, as well as the magical papyri.<sup>69</sup>

Once the alphabetical and non-alphabetical listings of drugs are completed in *Simples*, Galen apparently decides to approach pharmaceutical lore in another way in the ten books we have as *Compound Drugs Arranged by Location of Ailment*.<sup>70</sup> These ten books were written after Galen had put down the *Method of Healing*,<sup>71</sup> whereas the *Simples* predates it.<sup>72</sup> Galen's struggle with drugs—and how to classify them—can be discerned through the successive attempts he made to provide lucid catalogues: first is his *Properties of Cleansing Drugs*, writ-

<sup>55</sup> Ed. Kühn, XI, 813–14. As this is a shelf-fungus, the passage shows Galen's ignorance. G. Maggiulli, *Nomenclatura micologica latina* (Genoa, 1977), 85–87. Cf. Dioscorides III, 1.

<sup>56</sup> Ed. Kühn, XII, 1–158.

<sup>57</sup> *Ibid.*, 165–92.

<sup>58</sup> *Ibid.*, 192–208.

<sup>59</sup> *Ibid.*, 208–44.

<sup>60</sup> *Simples* X, preface (ed. Kühn, XII, 245–53).

<sup>61</sup> *Simples* X, 2–6 (ed. Kühn, XII, 256–63).

<sup>62</sup> *Simples* X, 2.7–12 (ed. Kühn, XII, 263–75).

<sup>63</sup> *Simples* X, 2.13–29 (ed. Kühn, XII, 275–308). *Simples* X, 2.15 (ed. Kühn, XII, 284–88) ends with Galen noting that "drinking the urine of a prepubescent boy is not recommended," and *Simples* X, 2.16 (ed. Kühn, XII, 288–90: on salivas) has a rare direct quotation from Nicander (*Theriaca* 86). *Simples* X, 2.17 (ed. Kühn, XII, 290) summarizes why one uses such materials. Cf. Paul of Aegina VII, 3, s.v. κόπρος (ed. Heiberg, II, 228).

<sup>64</sup> Ed. Kühn, XII, 310–77.

<sup>65</sup> *Simples* XI, 1.1 (snakes, esp. the *echidnē*; Scarborough, "Nicander's Snakes" [n. 15 above], 7–8); XI, 1.3 (marrow); and XI, 1.10 (rabid dog's liver). ed. Kühn, XII, 311–23, 311–33, and 335.

<sup>66</sup> *Simples* XI, 1.23 (spider webs); XI, 1.44–45 (blister beetles); XI, 1.36 (cicadas); XI, 1.15 (castor); and XI, 1.31 (brains, kid-

neys, and eggs). Ed. Kühn, XII, 343, 363–64, 360, 337–41, and 349–55. Charred or burned crabs, or more accurately the ashes of crabs, are prescribed in *Simples* XI, 1.24 (ed. Kühn, XII, 356–59). See J. Scarborough, "Some Beetles in Pliny's Natural History," *Coleopterists Bulletin*, 31 (1977), 293–96 ("Spanish Fly" and beetles of Lyttinae) and (same author), "Nicander II," 13–14, 20–21, 73–80 with nn. 134–45, 215–30, and 237–325 (blister beetles, descriptions, and purported remedies for the ingestion of "Spanish Fly" in classical antiquity); and (same author), "The Drug Lore of Asclepiades of Bithynia," *PH*, 17 (1975), 43–57 (51: castor).

<sup>67</sup> Ed. Kühn, XII, 369–77.

<sup>68</sup> *Simples* XI, 2.11 (sponges); XI, 2.12 (garum); XI, 2.3 (coral); and XI, 2.5–10 (salts and salt products). Ed. Kühn, XII, 376, 377, 370–71, and 372–75. For garum, see R. I. Curtis, "In Defense of Garum," *CJ*, 78 (1983), 232–40, and [same author] "The Garum Shop of Pompeii," *Cronache Pompeiane*, 5 (1979), 5–23. For sponges, see J. Théodoridès, "Considerations on the Medical Use of Marine Invertebrates," in M. Sears and D. Merriman, eds., *Oceanography: The Past* (New York, 1980), 734–49 (esp. 734–36).

<sup>69</sup> Cf. *PGM*, I, 224–25; IV, 1439–40, 2574–75, 2585, 2651; VII, 486; XII, 410, 414.

<sup>70</sup> Ed. Kühn, XII, 378–1007, and XIII, 1–361.

<sup>71</sup> *Drugs by Location* I, 1 (ed. Kühn, XII, 378).

<sup>72</sup> Ilberg, *Schriftstellerei*, 89.

ten before A.D. 169;<sup>73</sup> then Galen wrote the second of his “drug books,” *Simples*, probably in the 170s, number six on the list of the works as suggested by Ilberg, after Galen’s return to Rome in 169;<sup>74</sup> *Location* was written sometime in the period between A.D. 180 and 193, preceded by *Compound Drugs Arranged by Kind*.<sup>75</sup> Even though Ilberg shows that *Drugs by Kind* was composed before *Drugs by Location*, the Kühn edition places *Location* previous to *By Kind*, so that the following synopsis proceeds according to the unfortunately erroneous order (which has become traditional) set down in the Kühn volumes. Both *Drugs by Location* and *Drugs by Kind* indicate Galen’s continual efforts to obtain clarity in description of medicinals, and Ilberg rightly notes that these two collections of drug lore came from Galen’s pen very close to one another in time, perhaps in the two or three years preceding the fire in the Temple of Peace in A.D. 192.<sup>76</sup>

The arrangement of drugs in *Location*, so Galen writes,<sup>77</sup> is inspired by the example of Hippocrates, and would seem to show an order of the simplest sort: a beginning with affections of the head would lead, naturally enough, to ailments to be treated as one proceeds down from the head through other parts of the body (each with its own malfunctions: *tou kamnontos krasis hē te tou paschontos moriou physis*<sup>78</sup>), a manner called in the later Latin tradition, *a capite ad calcem*. What follows in *Drugs by Location* is a series of suggestions for various problems, indicative more of an “upper class” practice and a culling of beauty-care manuals than of Galen’s original intent to organize drug lore in a logical head-to-toe pattern. Titles of the sections delineate the subject matter of *Drugs by Location*, almost in contradistinction to what Galen has said he wants to do in the short preface: “Alopecia,” “On Hair Loss,” “On the Coloring of Hair,” “Drugs for Broken Hair,” “Thin Hair,” “On Hair that is Dying,” and “Dandruff.”<sup>79</sup> Much of this material comes from quoted extracts of Criton’s books on drugs,<sup>80</sup> in turn extracting earlier sources on pharmaceuticals under the names of Archigenes, Cleopatra, and Apollo-

nius.<sup>81</sup> Book II of *Drugs by Location* has recipes from a number of sources on “illnesses of the head,”<sup>82</sup> but most of the prescriptions for ear and nose problems are in Book III,<sup>83</sup> and the list of “authorities” has expanded to include Damocrates (recipes in poetry), Heras, Apollonius, Archigenes, Andromachus, Xenocrates, Harpalus, Harpocrates, Solon the Dietician, Zoilus the Ophthalmologist, Asclepiades, Charixenus, Antonius Musa, Heraclides of Tarentum, etc.<sup>84</sup> Eye diseases and numerous *kollyria* recipes comprise *Location* IV,<sup>85</sup> and more “beauty aids” for eye-bruises and black eyes begin *Location* V,<sup>86</sup> followed by lachrymal fistulas,<sup>87</sup> and salves, ointments, and plasters for the forehead, along with a great number of mouthwashes, dentifrices (Damocrates’ poems) and treatments for various tooth problems.<sup>88</sup> Stomach soothers and gargles form Book VI,<sup>89</sup> congestion relievers and arteriacs are Book VII,<sup>90</sup> but *Drugs by Location* IX contains a melange of remedies, including internal treatments for jaundices and affections of the spleen, followed by hemorrhoids, priapism, anal suppositories, and finally a recipe for the treatment of “uterine suffocation.”<sup>91</sup> Book X provides recipes for the treatment of kidney problems, gout, sciatica (*ischias*), and arthritis,<sup>92</sup> and at one point where a poem of Damocrates is being quoted for a cure of sciatica, there is clear indication that an illustrated text has been consulted.<sup>93</sup> *Compound Drugs Arranged by Location of Ailment* does not emerge as a complete and coherent tract on drug lore, but seems to be a potpourri of recipes collected and loosely grouped by external parts, emphasizing the head, with sections on gout, sciatica, and the like that might formally qualify the work as a “head-to-toe” treatise.

The third of Galen’s massive pharmaceutical

<sup>81</sup> Fabricius, 198–99 (Archigenes), 180–83 (Apollonius).

<sup>82</sup> Ed. Kühn, XII, 498–598.

<sup>83</sup> *Ibid.*, 599–695.

<sup>84</sup> Fabricius, 189–90 (Damocrates), 183–85 (Heras), 180–83 (Apollonius), 198–99 (Archigenes), 185–89 (Andromachus the Younger), etc. M. Wellmann, “Beiträge zur Quellenanalyse des Älteren Plinius,” *Hermes*, 59 (1924), 129–56 (140–42; Xenocrates; 142–43: Solon).

<sup>85</sup> Ed. Kühn, XII, 696–803.

<sup>86</sup> *Ibid.*, 804–93.

<sup>87</sup> *Ibid.*, 820–22.

<sup>88</sup> *Ibid.*, 889–93 (Damocrates’ poems).

<sup>89</sup> Ed. Kühn, XII, 894–1007.

<sup>90</sup> Ed. Kühn, XIII, 1–115.

<sup>91</sup> *Ibid.*, 228–320. “Uterine Suffocation”: *Location* IX, 10 (ed. Kühn, XIII, 319–20). Cf. *PGM*, VII, 260–71, and Soranus, *Gynecology* III, 50 (ed. Ilberg, pp. 127–28).

<sup>92</sup> Ed. Kühn, XIII, 321–61.

<sup>93</sup> *Ibid.*, 351.

<sup>73</sup> Ed. Kühn, XI, 323–42. Ilberg, *Schriftstellerei*, 77.

<sup>74</sup> Ilberg, *Schriftstellerei*, 89.

<sup>75</sup> *Ibid.*, 20–23 and 84.

<sup>76</sup> *Ibid.*, 84.

<sup>77</sup> *Drugs by Location* I, 1 (ed. Kühn, XII, 381).

<sup>78</sup> *Ibid.* (ed. Kühn, XII, 378).

<sup>79</sup> *Drugs by Location* I, 2–9 (ed. Kühn, XII, 381–497).

<sup>80</sup> On Criton, physician to Trajan (A.D. 98–117), see E. Kind, “Kriton (7),” *RE*, Vol. XI, part 2 (Stuttgart, 1922), cols. 1935–38, and J. Benedum, “Kriton,” *RE*, Supplementband XIV (Stuttgart, 1974), cols. 216–20.



works is titled *Compound Drugs Arranged by Kind*.<sup>94</sup> It seems that Galen had been attacked by other physicians for his earlier writings on drugs,<sup>95</sup> which had omissions and faulty principles of organization; it also seems apparent that he wrote *Drugs by Kind* late in life, after the fire at the Temple of Peace in A.D. 192.<sup>96</sup> He will stick by his “system of degrees” as developed in the *Simples*, but he has shifted somewhat as he begins to write this “third approach” to drugs, taking up the venerated “treatment by contraries.”<sup>97</sup> What follows in the seven books of *Drugs by Kind* is compilation accompanied by commentary, interspersed by recipes, and the remedies “work” according to the theory of treatment by contraries. An odd sort of fuzziness characterizes the initial chapters of *Drugs by Kind* I, but there is a greater care with sources than one finds in Galen’s earlier treatises on pharmacy, illustrated by the subtitles: “A White [Plaster] from [White] Pepper, as Compounded by Attalus and Heras,” followed by “Attalus, as Quoted by Andromachus, on the Compounding of a White [Plaster] for a Small Wound by a Rabid [Dog] and for Wounded *Neura*.”<sup>98</sup> Heras was an authority on rabies,<sup>99</sup> but Galen is concentrating his attention in Book I of *By Kind* on the white color of the plasters under discussion, and he ends the book with a quotation from Damocrates’ medical poem, “On the White Plaster.”<sup>100</sup> Green plasters occupy Galen in *By Kind* II, 2–4 (Kühn, XIII, 470–99), but *By Kind* II, 3 (Kühn, XIII, 496) shows that Galen is *not* arguing that the similarities of color give certain “related” plasters their effectiveness, but that their similarity of properties (*dynameis*) provide their usefulness—even though he condemns Andromachus for taking color as a guide. *By Kind* II, 5 (Kühn, XIII, 499–503) is “Drugs That Can be Wiped Away Quickly,” and here are salves and oily ointments as cited (without specific recipes) from Criton, Heras, Archigenes, Philip, Menecrates, and other authorities. *By Kind* II–IV contain a large number of suggestions on plasters, drugs for wounds of the *neura*, and drugs for promoting the healing of wounds and ulcerations, as well as plasters and ointments that helped form scar tissue (cicatrizization), culled

from a number of sources.<sup>101</sup> Book V of *By Kind* (Kühn, XIII, 763–858) might be titled “Multi-Purpose Drugs,” and Galen gives a dazzling display of his purported knowledge of pharmaceuticals—or at least his command of the written sources that have recorded such multiple-use drugs. In *By Kind* V, 1 (Kühn, XIII, 763–65), Galen restates his basic, underlying theory of drugs by describing them all, in the first place, as characterized by the hot, the cold, the dry, and the wet, and then, consequently, considering the compounding from simples of these drugs according to their dominant quality; this, in turn, would indicate how these compound medicinals would perform according to their “thinning” properties, “thickening” properties, “promotion of scarring” properties, induction of flesh-growth properties, and so on. Only in this way, Galen insists, can one comprehend why drugs work as they do. Formulas abound. Authorities appear in a rapid blur, and the list of names cited in Book V of *By Kind* indicates which sources Galen had at his disposal, and will provide part of the pattern through which Byzantine medical writers would use *their* sources—whether through Galen or independently.<sup>102</sup>

Book VI of Galen’s *Compound Drugs Arranged by Kind* (Kühn, XIII, 859–945) takes up the subject of multi-use plasters. First comes a “Preface” (*By Kind* VI, 1 [Kühn, XIII, 859–62]) in which Galen notes that the previous book of *By Kind* has considered the plasters called *poluchrēstoi*, designated as

<sup>101</sup> Ed. Kühn, XIII, 503–762.

<sup>102</sup> Heras of Cappadocia, Epigonus, “from the Temple of Hephaestus at Memphis” (a plaster made from dittany [Kühn, XIII, 778–80]), Hicesius, Criton quoting Heras, Criton quoting Hicesius, Andromachus, Criton quoting the recipe of the “Medicine of Machaïron” for the healing of all kinds of wound (Kühn, XIII, 796–97), Criton quoting Damocrates, Asclepiades (*By Kind* V, 4 [Kühn, XIII, 801–2] along with a recipe compounded by Galen), Phylacus quoting Diophrantus the surgeon, Andromachus on green plasters (quoting Evagrius, Epicurus, Alcimionius or Nicomachus), Heraclides of Tarentum quoting Hicesius, Philoxenus, Damocrates’ poem on making a plaster from dittany (*By Kind* V, 10 [Kühn, XIII, 820–23]), Asclepiades quoting Aristarchus of Tarsus (V, 11 [Kühn, XIII, 824–25]), Andronius, Terentius, Areius, [Scribonius] Largus (Kühn, XIII, 828), Threptus, Hierax of Thebes, Lucius, Magnus of Philadelphia, Gaius of Naples, Agathinus, Mnesitheus, Apollonophanes, Nicolaus, Petronius, Agathocles, Achilla (Kühn, XIII, 834), Isidorus, Alcimion quoting Apollonius Archistrator on the “pill that acts like a scalpel” (Kühn, XIII, 835), Glaucius, Tiberius Caesar, Phanius, Antipatrus, Publius, Philinus, Melitonius, Apollonius of Tarsus, Asclepiades quoting Marcellus, Xenocrates from his work *Drugs from Vetch* (Kühn, XIII, 846), a recipe of Serapis “set up on metal plates: a fleshmaker” (Kühn, XIII, 847), Tryphon, Heliodorus, Ptolemy, Eunomus, Theotropus quoting Areius, Apelles, and Cleobulus. Galen has gained most of these names and recipes through the collections of Andromachus, Asclepiades, and Criton.

<sup>94</sup> Ed. Kühn, XIII, 362–1058 (in 7 books).

<sup>95</sup> *By Kind* I, 1 (ed. Kühn, XIII, 363).

<sup>96</sup> *By Kind* I, 1 (ed. Kühn, XIII, 362).

<sup>97</sup> *By Kind* I, 1 (ed. Kühn, XIII, 367).

<sup>98</sup> *By Kind* I, 13–14 (ed. Kühn, XIII, 414–27).

<sup>99</sup> *By Kind* I, 16 (ed. Kühn, XIII, 431–42: Heras on hydrophobia, accompanied by Xenocrates).

<sup>100</sup> *By Kind* I, 19 (ed. Kühn, XIII, 455–57).

those preparations to be “laid on” for treatment of open sores, ulcers, and the like, either to cause them to heal rapidly, or to cause them to remain open, according to the course of therapy prescribed by the physician. Galen says he has observed the compounding of such drugs during his frequent travels, and how he will, now, record some further “wide-use” plasters, but only after he has verified their efficacy in his own experience with patients. These plasters are those which are employed for flesh that is rotting or semi-putrified, and he will begin with plasters made from herbs. But instead of a formula designated by some geographic location, Galen starts his account by quoting Criton’s “Plaster from Herbs” (*By Kind* 2 [Kühn, XIII, 863–64]), with measurements. One wonders what happened to Galen’s gathered drug lore, presumably recorded from his travels, when he proceeds to explain why *Criton’s* formula would contain poppies (*mēkōn*: *Papaver* spp.), black henbane (*hyoskyamos*: *Hyoscyamus niger* L.)—these would give the “cold”—and the scarlet pimpernel (*anagallis*: *Anagallis arvensis* L.), which would provide the “drying property.” Following in *By Kind* VI, 1 (Kühn, XIII, 869–73) is a “Squill Plaster” (*skilla*: *Urginea maritima* [L.] Baker), again probably from Criton’s collection, and Galen commends this formula provided one tempers it with wax (Kühn, XIII, 871). After discussing further recipes from Criton and Andromachus,<sup>103</sup> Galen proceeds to the vexed question of weights and measures: after his valuable discussion of how weights and measures are calculated in Italy, Greece, Alexandria, and Ephesus, it seems clear enough that Galen is rather frustrated by the inexactitude of the formulas he has received in the pharmacological sources, and especially by the inexact equivalences that seem to thwart his reproducing the formulas to his satisfaction.<sup>104</sup> Andromachus continues to supply Galen with the listed

plaster recipes, until one reaches “A Tyrian Plaster” (*By Kind* VI, 12; [Kühn, XIII, 915–23]), which turns out to be another medical poem by Damocrates, not an original formula from Phoenician Tyre as might have been recorded by Galen.<sup>105</sup> The confused nature of Galen’s drug formulas in *By Kind* may be illustrated by an example from the listings of *malagmata*, “emollient” or “soft” plasters. *By Kind* VII summarizes *malagmata* with an apparent strained classification system, as Galen tries to distinguish them from other plasters,<sup>106</sup> and Galen’s quotation from Heras on a compound called the *kērelaion* shows how Galen’s written sources had confused the specific names of these drugs—and by implication why the best of the Byzantine writers on pharmacy did *not* use Galen as an exact blueprint:

*Kērelaion*: Praised by Heras above all among Drugs. “Take freshly defibred clear fat, 44 [Roman] ounces, 24 ounces of beeswax, 6 ounces of cerussite,<sup>107</sup> 6 ounces of massicot,<sup>108</sup> and dissolve together the dry ingredients, and shortly they will become congealed.” Heras said “the beeswax and the clear fat are the softening properties.” Thus if some beeswax would be mixed with a little oil, you will make what is called by the doctors a *kērelaion*, a wax-oil.<sup>109</sup> But clearly the oil ought not to be called either the squeezings of unripe grape [*to omphakinon*] or oil of unripe olives,<sup>110</sup> nor should one assume the addition of the oil of palm leaves.<sup>111</sup>

The remainder of *By Kind* VII<sup>112</sup> continues in this confusion, with numerous quotations from Damocrates, Andromachus, Asclepiades (probably the “Younger,” or Pharmacion), and other names now familiar from other Galenic drug books. One may suspect textual corruptions in the Kühn Greek, but interpolations do not explain away the rampant disorder in drug classifications, except for the broad categories of plasters, emollients, earths, herbal simples, and the like. Even though Galen has a reasonably clear theory of drug action, it is smothered by the numerous and often contradic-

<sup>103</sup> Of interest in terms of preparation technique is “A Plaster from a Whetstone,” i.e., a powdered compound rubbed on a whetstone (ed. Kühn, XIII, 874–82; cf. Dioscorides I, 98). Criton also provides Galen with a formula from Heras (*By Kind* VI, 3 [Kühn, XIII, 882–83]), another by Serapion (*By Kind* VI, 4 [Kühn, XIII, 883–84]), and another by Andromachus (*By Kind* VI, 5 [Kühn, XIII, 884–85]). Galen seems to take some data directly from Andromachus (quoting Isidore of Antioch) on a plaster for gangrene (*By Kind* VI, 6 [Kühn, XIII, 885–86]). Then Galen tells us he will take up other sorts of plasters, arguing at some length that one ought not to be ignorant of the good data at one’s fingertips—unlike so many in his day (*By Kind* VI, 7 [Kühn, XIII, 889]), and then we receive a formula (again from Andromachus) for the Egyptian *Phaia*[?] Black[?] Plaster (*By Kind* VI, 8 [Kühn, XIII, 890–91]), a good example of an excellent compound ignored by physicians (Kühn, XIII, 891).

<sup>104</sup> Ed. Kühn, XIII, 895–97.

<sup>105</sup> *By Kind* VI, 12 (Kühn, XIII, 915–23).

<sup>106</sup> *By Kind* VII, 1 (Kühn, XIII, 946–51).

<sup>107</sup> PbCO<sub>3</sub>, lead carbonate, or “white lead” (*Psimythion*). Preparation of white lead: Theophrastus *On Stones* 56. Preparation of white lead salves: *Geoponica* XVII, 7.2; XVIII, 15.3; and VII, 15.18 (ed. Beckh, pp. 473, 494 [from Didymus], and 203 [from Sotion]). Cf. Dioscorides V, 82 and 88.

<sup>108</sup> PbO, lead monoxide (*lithargyros*). Cf. *PGM*, XII, 194; Nicander *Alexipharmaca*, 594; Galen, *Drugs by Kind* I, 5: “Plasters Made from Lead Monoxide” (Kühn, XIII, 394–98).

<sup>109</sup> This is Galen’s “cooling wax salve” in *Hygiene* VI, 14.8 (ed. K. Koch, *Galen De sanitae tuenda* [Leipzig, 1923; in *CMG* V 4, 2], p. 195).

<sup>110</sup> Theophrastus, *On Odors* 15. Dioscorides I, 30.

<sup>111</sup> *By Kind* VII, 2 (Kühn, XIII, 952–53).

<sup>112</sup> *By Kind* VII, 4–16 (Kühn, XIII, 958–1058).



tory quotations from earlier sources, and Galen's attempts to "explain" why various drugs might be included in the works of Criton, Andromachus, Damocrates, and others, are often surprisingly feeble. Galen generally has not actually sought out the drugs he prescribes—as he likes to boast—but has availed himself of a rich doxographical tradition in Greco-Roman pharmacy, a tradition that was exploited earlier by Criton in the reign of Trajan,<sup>113</sup> and by Dioscorides in the middle of the first century. Unlike Dioscorides, however, Galen did not simply survey his predecessors' work,<sup>114</sup> but excerpted those tracts in large swatches. Once the early Byzantine pharmacologists had analyzed Galen's "Drug Books," they were forced to rearrange, streamline, and "edit them" rather heavily, even though Galen remained a venerated fountainhead of drug lore. It is very significant that Byzantine medical writers, from Oribasius through Paul of Aegina, quite frequently sought out the "original" writings on drugs from earlier Greco-Roman antiquity, and did not continue the pharmaceutical doxography illustrated by Galen's summaries in the late second century.

#### ORIBASIIUS AND PHARMACOLOGY

Oribasius functioned as court physician to the Emperor Julian (A.D. 361–363), but he had been friend and confidant of Julian before the eventful months of 360 and 361 that led to his elevation to the undisputed possession of the imperial purple. Oribasius had prepared a synopsis of Galen's works at Julian's request, while the future emperor served Constantius as Caesar in Gaul.<sup>115</sup> In 360—again at the request of Julian—he compiled a second work that summarized not only Galen but also many other medical authorities, and we have forty books plus a number of fragments of the original seventy in this *Medical Collection*. From the *Medical Collection*, one may gauge how Galen's pharmacology was employed by Oribasius, and one may also discern some skillful rearrangements, reclassifications, and fresh juxtapositions as Galen is quoted directly. In many respects, Oribasius' use of Galen's works provides a reasonable measure of what tracts by Galen were known in the mid fourth century, and the numerous quotations from all three of Galen's massive

pharmacological books show that they all should probably be included within the "genuine" Galenic corpus. *Antidotes* is also excerpted,<sup>116</sup> but not to the extent that Oribasius uses Galen's *Mixtures and Properties of Simples* (593 citations), *Drugs by Location* (206 citations), and *Drugs by Kind* (62 citations). *Theriac to Piso* does not appear among the quoted extracts.

These raw numbers (almost 600 extracts from Galen's *Simples*, just over 200 from *Location*, and 62 from *By Kind*) may suggest a basic pattern for Oribasius' adaptation of Galenic pharmacology. In the first place, Galen's *Simples* had laid down a fairly precise theory of drug "properties," and this tract also included almost all of the listed medicinals known to Greco-Roman pharmacy; secondly, since Oribasius does not quote Damocrates' medical poems (nor any medical poetry at all), this would suggest that Oribasius valued *Location* and *By Kind* (in which Damocrates' poems bulk large) less than *Simples*, or, that medical poetry had fallen out of fashion by Oribasius' day; third, since Galen had given a fairly complete listing of pharmaceuticals in *Simples*, first listed alphabetically (the plants) and then "classed" by source (animals, minerals), Oribasius apparently assumed Galen's *Simples*, combined with the rearranged alphabetical listing of drugs taken from Dioscorides' *Materia medica*,<sup>117</sup> would provide the important substances used in pharmaceutical therapy; Galen's two other books on drugs (*Drugs by Location* and *By Kind*) did not offer a significant improvement in perceptions of drug lore. Moreover, Galen's *Location* and *By Kind* merely repeated the substances (using other authorities) previously listed in his *Simples*, so that there was no quantitative improvement in Galen's nearly 450 drugs contained in his *Simples* that could not be gained by the more streamlined listing of pharmaceuticals from Dioscorides. Oribasius can thus assume his pharmacology would include all of the over 600 "standard" drugs by a judicious combination of Galen and Dioscorides, as well as careful quotations from other authorities directly from their works. Oribasius' arrangement of drugs most likely resulted from the requirements of an active and personal practice of medicine—particularly seen in the quotations of Galen's *Simples* in *Medical Collection* XV—and his adaptation of drug lore became a standard method in medical botany and

<sup>113</sup> See n. 80 above, and J. Scarborough, "Criton, Physician to Trajan: Historian and Pharmacist," in J. Eadie and J. Ober, eds., *Festschrift Chester Starr* (Washington, D.C., 1984) in press.

<sup>114</sup> Scarborough and Nutton, "Preface," 190.

<sup>115</sup> Oribasius, *Medical Collection* prooemium 1–2 (ed. Raeder, I, 4).

<sup>116</sup> Raeder, IV, 327 (nine citations).

<sup>117</sup> Oribasius, *Medical Collection* XI–XIII (ed. Raeder, II, 80–180).

pharmacology still followed in modern times.<sup>118</sup>

Galen's *Simples* had developed a tight theory of pharmaceutical action, based upon primary "qualities" (viz. properties) of particular classes of drugs, followed by a second set of secondary "qualities," and then a third classification of tertiary properties.<sup>119</sup> Galen had argued that the Hot, Cold, Wet, and Dry were common to all substances, and that changes came to matter through either active or passive influences.<sup>120</sup> This, in turn, explained the effects of all drugs.<sup>121</sup> Following from this premise, Galen can then argue for "secondary" properties and "tertiary" properties from the pharmaceutical effects derived from combinations and mixtures of the "primary" properties, as such would be perceived by the senses.<sup>122</sup> There is, however, a vagueness to Galen's "tertiary" qualities/properties, and Harig has shown that Galen meant merely "local effects" in his "tertiary level," that is, local effects of the "secondary qualities."<sup>123</sup> Thus in the beginning of Book V of *Simples*, Galen can make the statement that it is better to classify pharmaceutical compounds by their *eidē* ("species" or "kinds"),<sup>124</sup> apparently meaning their "useful effects" in pharmacy as they are perceived by the senses. By way of illustration, Galen writes that it is more accurate to say that wheat-meal plaster is a balance between the Wet and Hot,<sup>125</sup> rather than to list the plaster's qualities/properties as pus-producing, soothing, cathartic, and relaxing.<sup>126</sup>

Oribasius does some very significant things with Galen's drug theory, and the following can only be suggestive. In quoting from Galen's *Simples* V, 2,<sup>127</sup> Oribasius merely excerpts what Galen has to say about the "utility of drugs" (*peri chreias tōn pharmakōn*), the basic statement of how one understands drug action. Oribasius has, in effect, extracted exactly those passages from Galen's verbose

description of drug properties which are precise and clear: "The utility of drugs among men is often from this alone: the heating, cooling, drying, and the moistening, or from the combination of effects as produced [by these properties]." Oribasius includes Galen's assumptions that such physical properties as condensation of drugs, rarification, and so on, would also be explained by the underlying theory of *stoicheia/dynameis*, but the repetitive passages following line 5 (Kühn, XI, 707) are not quoted. *Medical Collection* XIV, 4 (Raeder, II, 184–85), is not a continuation of Galen's *Simples* V, but begins with an excerpt from *Simples* III, 11 (Kühn, XI, 564–65), titled by Oribasius "How One Determines the Elementary Property of the Full Compound by Comparison with an Exactly Balanced Substance." *Simples* III, 11 is employed here because Galen has defined a "moderate *krasis*" (a "balancing," or in archaic English, a "temperament"), and such is determined by the sense of touch. *Medical Collection* XIV, 4.1–3, is extracted from Galen's *Simples* III, 11, but *Medical Collection* XIV, 4.4 is from *Simples* III, 13 (Kühn, XI, 571). Oribasius again has skipped an incredibly verbose and repetitive section of Galen's *Simples*, and extracts exactly those passages which summarize precisely what Galen means in terms of his mid-way *krasis*, after Galen has provided an excellent illustration of the cooling properties of rose oil in *Simples* III, 11. Oribasius has shown his shrewd adaptation and rearrangement of Galen, and the *Medical Collection* becomes an attempt to give Galen a clarity—using his own words—lacking in the original texts. Oribasius also has digested an enormous quantity of Galen's writing, no mean feat in itself, and has simplified Galen's tripartite "intensity theory" of drugs so that the original notion is preserved for the employment of future physicians and pharmacologists. In fact, as Harig has argued, Oribasius' quotations of Galen's *Simples* ensured the preservation of the most essential parts of Galen's theory, shorn of the vague and generally unsatisfactory extension of the theory into a "tertiary" level of effects.<sup>128</sup>

Oribasius exhibits great care in citing his sources. One would expect him to cite materials as he had found them quoted in earlier compendia of recipes, such as are found in Galen's *Drugs Arranged by Location of Ailment* and *Drugs Arranged by Kind*. A few examples of sources cited by name, compared to the sloppy manner of Galen's use of recipe col-

<sup>118</sup>G. Harig, "Die Galenschrift 'De simplicium medicamentorum temperamentis ac facultatibus' und die 'Collectiones medicae' des Oribasios," *NTM*, 7 (1966), 1–26 [4].

<sup>119</sup>See G. Harig, *Bestimmung der Intensität im medizinischen System Galens* (Berlin, 1974), *passim*.

<sup>120</sup>Galen, *Elements According to Hippocrates* I, 9 (ed. Kühn, I, 485), and *Commentary on Hippocrates' On the Nature of Man* I, 7 (ed. J. Mewaldt, *Galen's In Hippocratis de natura hominis* [Leipzig, 1914; in *CMG* V 9, 1], p. 22).

<sup>121</sup>Galen, *Simples* I, 8 (ed. Kühn, XI, 397).

<sup>122</sup>Galen, *Simples* III, 13, and V, 2 (ed. Kühn, XI, 573 and 709–10).

<sup>123</sup>Harig, *Intensität* (n. 119 above), 110–15.

<sup>124</sup>Galen, *Simples* V, 1 (ed. Kühn, XI, 704–6).

<sup>125</sup>Galen, *Simples* V, 2 (ed. Kühn, XI, 712).

<sup>126</sup>Galen, *Simples* V, 2 (ed. Kühn, XI, 711–12).

<sup>127</sup>Oribasius, *Medical Collection* XIV, 3 (ed. Raeder, II, 184) = ed. Kühn, XI, 706–7.

<sup>128</sup>Harig, "Oribasius" (n. 118 above), *passim*.

lections by Criton, Andromachus, and Asclepiades the Pharmacist, will suggest Oribasius' meticulous care and insistence on quoting *directly* from the original work. It will be recalled that Galen cites Xenocrates for a number of animal-derived drugs,<sup>129</sup> and one would, presumably, expect Oribasius to pick up these citations and record them somewhere in the *Medical Collection*. Except, however, for some scholia recording parallel passages from Xenocrates, Galen, and Dioscorides,<sup>130</sup> and one fragmentary quotation (twenty-one lines) from Xenocrates' "Plasters Made from Whelk [*kēryx*] and murex [shellfish],"<sup>131</sup> Xenocrates appears only in a lengthy, direct quotation from *Foods from Water Animals*,<sup>132</sup> which fits neatly into Oribasius' "elementary" books on preparation and recommendation of healthy foods. Here are how one classifies fish and shellfish,<sup>133</sup> and a catalogue of agreeable and disagreeable fish in the diet. No bloods, rennets, or dungs appear in Oribasius' quotations from Xenocrates, and one is again struck by the display of good judgment in the employment of an earlier source, quoted directly and not through an intermediary. Other quoted authors receive similar treatment (for example, the obscure Heraclas),<sup>134</sup> so that Oribasius has "gone to the sources," unlike his verbose model, Galen.

There is ample evidence throughout Oribasius' writing—*Medical Collection*, [Medical] *Synopsis for Eustathius*, and [Medical] *Books for Eunapius*—not only that he had read and assimilated the writings of many authorities of medicine in the Greco-Roman tradition, but also that his medical practice included much personal knowledge of pharmaceuticals, which he was pleased to share with his son, and with his friend Eunapius. A few examples will illustrate. *Medical Collection* IX, 27 (= *Synopsis for Eustathius* III, 79 [Raeder, II, 30, and Raeder, ed., *Synopsis*, 89]) is "Plasters from the Husks of Wheat." He tells us that one can use the "leftovers" of the wheat by pounding the husks, and the plaster (made from combining the pounded husks with a honey-

vinegar mixture and a gum ammoniac [here probably *Ferula communis* L. or *F. marmarica* Asch. & Taub.; less likely *Dorema ammoniacum* D. Don.]) would be useful as a warming plaster for various skin ailments as well as liver and spleen problems. No source is discernable here, and there is only a slight resemblance to the mention of gum ammoniac by Dioscorides;<sup>135</sup> the suggestions by Dioscorides for *ammōniakon* in *Materia medica* III, 84 (Wellmann, II, 100–102) overlap with those by Oribasius only in terms of being useful for ailments of the liver and spleen (*Materia medica* III, 84.3 [Wellmann, II, 102]), but there is no combination with pounded husks of wheat. It is significant that Aetius borrows this account of the plaster of pounded wheat husks directly from Oribasius.<sup>136</sup> Thus, it is apparent that Oribasius was a skilled drug compounder in his own right, also shown by other adapted and "original" medicines.<sup>137</sup> Characteristic of Oribasius' command of drug compounding is his direct simplicity and general avoidance of complicated mixtures that might require exotic ingredients.

Oribasius was also well acquainted with Dioscorides' *Materia medica*, but he—like Galen before him—decided that Dioscorides' precise and difficult system of drug affinities was either too cumbersome for practical use,<sup>138</sup> or too diffuse as it stood. *Medical Collection* XI–XII (Raeder, II, 81–159) is an alphabetized listing of the simples in Dioscorides' *Materia medica* (456 substances, including some of Dioscorides' "animal products," for instance, *stear* ["fat"]), and *Medical Collection* XIII (Raeder, II, 160–80) is "From Dioscorides on the Properties [*Dynameis*] of 'Mined' Drugs [*Metallika*] and their Preparation" (88 medicinals, including various stones and earths). Oribasius has carefully alphabetized 544 pharmaceuticals as contained in Dioscorides' *Materia medica*, and there is, indeed, a succinct clarity that would be absent in Dioscorides' original tract. One can suppose that Oribasius drew up this listing, or one may assume that he took a previously-compiled alphabetical listing and simply reproduced it. Given Oribasius' normal habit of citing almost all of his sources by name, it seems unlikely that he had borrowed the alphabetical register of

<sup>129</sup>Galen, *Simples* X preface (ed. Kühn, XII, 245–53).

<sup>130</sup>Oribasius, *Medical Collection* XI A 54, and XV (ed. Raeder, II, 89, 293, and 296).

<sup>131</sup>Oribasius, *Medical Collection* XV, 3 (ed. Raeder, II, 296–97.).

<sup>132</sup>Oribasius, *Medical Collection* II, 58 (ed. Raeder, II, 47–57).

<sup>133</sup>Oribasius, *Medical Collection* II, 58. 11–13 (ed. Raeder, II, 48).

<sup>134</sup>Oribasius, *Medical Collection* XLVIII, 1–18 (ed. Raeder, III, 262–68). See also C. L. Day, *Quipus and Witches' Knots: The Role of the Knot in Primitive and Ancient Cultures, with a Translation and Analysis of "Oribasius De Laqueis"* (Lawrence, Kansas, 1967), 107–31.

<sup>135</sup>Dioscorides III, 48.3 (ed. Wellmann, II, 62). Cf. Pseudo-Dioscorides, III, 84 (ed. Wellmann, II, 101).

<sup>136</sup>Aetius III, 178 (ed. Olivieri [CMG VIII 1], p. 350).

<sup>137</sup>E.g., Oribasius, *Synopsis for Eustathius* III, 77 (Raeder, p. 88) = *Medical Collection* IX, 25 (Raeder, II, 28–29): "A Plaster Made from Beer-Yeast."

<sup>138</sup>Scarborough and Nutton, "Preface," 190.

Dioscorides from an unknown source, and the accuracy of the quotations would indicate that Oribasius had performed this onerous task himself. If so, it may be quite probable that Oribasius' alphabetical text of Dioscorides is the archetype of many later manuscripts of the Greek "alphabetical" Dioscorides, including the justly famous Vienna text of A.D. 512.<sup>139</sup>

#### FROM ORIBASIIUS TO AETIUS

Although it can be argued that Theodorus Priscianus' *Euporiston* could be included in the scope of early Byzantine medicine (Priscianus was court physician in the reign of Gratian [A.D. 375–383]), the text was written in Latin, as befitted the court of a western Roman emperor.<sup>140</sup> Moreover, the fascinating farrago of drugs and folklore that make up the *De medicamentis* by Marcellus Empiricus (*fl.* as *magister officiorum* under Theodosius I [A.D. 379–395]),<sup>141</sup> will not be considered here, since the work is in Latin, and belongs more to the history of pharmacy in early medieval western Europe. Caelius Aurelianus (?*fl.* c. A.D. 450) has left us a masterpiece of compression—also in Latin—of the best of the Methodist physicians, and the drug lore of Soranus of Ephesus assumes a major importance.<sup>142</sup> And the compendium of Cassius Felix, called *De medicina*, was published in A.D. 447, with the *a capite ad calcem* therapeutics of Galen summarized in Latin guise.<sup>143</sup> One would like to know more about Hesychius of Damascus (*fl.* A.D. 430 in Byzantium), the father of Psychestrus, Asclepiodotus, and Palladius,<sup>144</sup> but as important as were these medical practitioners in the fifth century, we learn about them through isolated quotations in later authors and from summaries as contained in the *Suda* and Photius' *Library*.<sup>145</sup> Alexander of Tralles (V, 4 [Puschmann, II, 163]) gives us a tantalizing bit about Psychestrus' therapy using a "liquifying diet,"<sup>146</sup> and all of these names, excepting Alexander of Tralles, were associated with some residence or study at Alexandria, which continued

to be a famous center for medical education of many varieties.<sup>147</sup> It is only with Aetius of Amida, who had indeed spent time in Alexandria,<sup>148</sup> in the early sixth century that one again can assess the next stages of development in early Byzantine pharmacology.

#### AETIUS OF AMIDA

Drug theory begins Aetius' account of medical practice. In fact, the lengthy *Preface* to Book I of Aetius' *Medical Books* (Olivieri, I, 17–30) is entirely devoted to theoretical pharmacology. The complete *Preface* emerges from Galen, but in a deftly arranged manner from several different Galenic passages, generally from *Mixtures and Properties of Simples*, with the first eighteen lines quoted from *Simples*, prooemium VII (Kühn, XII, 2–4). Even in English translation, one is able to detect Aetius' subtle yet crucial modulations of Galen's original, as well as the important reorganization of vital passages from Galen's pharmacological theory, so that clarity could replace imprecision:

The variations of the individual effects of drugs are due to each of them being to a certain sufficiency [*tō epi tosonde*: "to a certain degree" is the modern expression] hot or cold or dry or wet, or each having fine [or "small"] or coarse [or "large"] particles [or "parts"]. The extent/measure of the degree, however, of the attachments [lit. "fastenings-together"] in each of the drugs cannot be expressed with truthful accuracy. But we have attempted to encompass and characterize them with adequately clear terms and definitions for use in medical practice [*eis tēn cheian tēs technēs*]. We are demonstrating that there is one kind [*hen genos*] of drugs which is [*aphiknoumenon*: lit. "arriving at" or "coming into"] a same *krasis* as our bodies, when it has received some *archē* of both change and alteration [*allōsis*] from the hot in this kind of drugs, and, that there is another kind of drugs which is hotter. From this, it seems to me that four orders [*taxeis*] can be made: the first is indistinct [*asaphē*] to the senses, [and] detecting it necessarily comes through pure reason [*logos*]; the second is distinct and perceivable to the senses; the third is rather hot, but not to the point of burning; the fourth and last is the corrosive or caustic kind of drugs.<sup>149</sup> Likewise also for the cooling kind of drugs, the first order must come from pure reason in demonstrating its coldness, the second is cooling detectable by the senses, the third is rather cold, and the fourth causes

<sup>139</sup> Vienna, Österreichische Nationalbibliothek MS Gr. 1.

<sup>140</sup> V. Rose, ed., *Theodori Prisciani Euporiston* (Leipzig, 1894).

<sup>141</sup> Marcellus (ed. Liechtenhan).

<sup>142</sup> Caelius Aurelianus (ed. and trans. Drabkin).

<sup>143</sup> V. Rose, ed., *Cassii Felicis De medicina* (Leipzig, 1879).

<sup>144</sup> Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," *DOP*, 16 (1962), 100 = *Double Face of Janus*, 205–6.

<sup>145</sup> On Jacob Psychestrus: R. Asmus, *Das Leben des Philosophen Isidorus von Damaskios aus Damaskos* (Leipzig, 1911), esp. 72–75.

<sup>146</sup> Cf. Alexander of Tralles, ed. Puschmann, I, 74, and reffs. Puschmann, II, 162 n. 1.

<sup>147</sup> Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," 101–2 = *Double Face of Janus*, 206–7.

<sup>148</sup> Aetius I, 131, and II, 3 (ed. Olivieri [CMG VIII 1], pp. 65 and 154).

<sup>149</sup> *Pharmaka kaustika*. Galen, *Simples* V, 15 (ed. Kühn, XI, 754). Zopyrus in Oribasius, *Medical Collection* XIV, 57.1 (ed. Raeder, II, 226).

necrosis.<sup>150</sup> Analogous in these definitions are also the wetting and drying drugs.<sup>151</sup>

Galen (*Simples* VII, 10.1) then proceeds to speak of catnip (*kalaminthos*: *Nepeta cataria* L.),<sup>152</sup> writing “catnip is basically of small particles and has a hot and dry *krasis*, and is from the third order with both qualities.”<sup>153</sup> Aetius, however, does not continue with *Simples* VII: the next twelve lines in the *Preface* to Book I of the *Medical Books* come from Galen, *Simples* III, 13 (Kühn, XI, 571–72):

Thus let there be set down a clear instruction of these very degrees [or sufficiencies]: in the first order [*taxis*] of cooling drugs would be placed rose oil or the rose (*Rosa gallica* L., and related spp.) itself; in the second would be placed rose-juice [*ho to rhodou chylos*]; and in the third and fourth orders we would include—for good reason—the very cold drugs: hemlock (*kōneion*: *Conium maculatum* L.), the juice of the opium poppy (*mēkōneion*, viz. opium from *Papaver somniferum* L.), mandrake (*mandragoras*: either *Mandragora officinarum* L. [mandrake], or *Atropa belladonna* L. [deadly nightshade]), and black henbane (*hyoskyamos*: *Hyoscyamus niger* L.). Concerning the hot drugs, dill (*anēthon*: *Anethum graveolens* L.) and fenugreek (*tēlis*: *Trigonella foenum-graecum* L.) are in the first order; the drugs which appear next to them are in the second order; and in the third and fourth orders we would include the caustic and corrosive drugs. And in the same manner in regard to the wetting and drying drugs, one begins with a drug of moderate and proportionate [*krasis*], [and] we will make orders [*taxeis*] one after the other until the farthest extremes [*akroi*]. For some use of such knowledge is not unimportant in the medical practice [*methodos*].

Aetius now drops Galen's *Simples* III, 13 (which goes on to grumble about the general ignorance of doctors in such matters), and switches to an adaptation of *three lines* from Galen's *Simples* IV, 4 (Kühn, XI, 632), in which Aetius writes: “One should also use the sense of taste, and retain in the memory the peculiarity of each quality of the juices” (Olivieri, I, p. 18, lines 15–17); and then Aetius shifts again to four, slightly modified lines from Galen, *Simples* I, 39 (Kühn, XI, 453), “. . . as, for example, when such a substance [*sōma*: lit. “body”] is laid on the tongue, it greatly dessicates, contracts, and deeply roughens it, such as unripe wild pears (*achrades aōroi*: probably *Pyrus pyraster* Burstd., or *P. amygdaliformis* Vill.), Cornelian cherries (*krana*: *Cornus mas* L.), and

the like; every such substance is called sour [or “astringent”: *stryphnon*] since it is intensely bitter [*aus-tēron*]” (Olivieri, I, p. 18, lines 17–20). With some slight syntactical adaptations, Aetius has provided a lucid account of Galen's basic pharmacological theory, using Galen's own words and phrases, but judiciously selected and rearranged so that the reader understands (as best as he would be able) this system of drug classification “by intensity” or “by degree.” What has been muddled, scattered, and often repeated in Galen's original texts, has now been compacted, edited, and streamlined. The remainder of Aetius' *Preface* to Book I of his *Medical Books* shows a similar ability, and Galen's enormously influential classification of drugs “by degrees” has emerged in the form in which it would be used by countless physicians and pharmacists until well into the eighteenth and nineteenth centuries.

Once Aetius has completed his redaction of Galen's drug theory, he then proceeds to list alphabetically 418 medicinals of plant origin, almost all quoted from Galen, but with an occasional passage from Rufus, Dioscorides, and Oribasius.<sup>154</sup> Book II lists, in part alphabetically, 195 medicinals,<sup>155</sup> an occasional clipped, simplified recipe of drugs derived from metals (lit. “things mined”), stones, earths, and a wide spectrum of “animal products” (from milk to insects); most entries are quoted from Galen, Oribasius, and Dioscorides, but there are a few citations from Rufus, Antyllus, and Theophrastus. Book II, 196–271 returns to the “drugs by degrees” system<sup>156</sup> and now “fits” the 613 substances into the various grades of heating, cooling, drying, and moistening medicinals, followed by a discussion of the properties (*dynameis*) of foods.<sup>157</sup> Then Aetius turns his attention again to the definition of Galen's puzzling “large” and “small” particles as they relate to the properties of foods,<sup>158</sup> but the source is Oribasius, not Galen. With Book III,<sup>159</sup> Aetius begins to list formulas and recipes for cathartics and similar drugs, and his arrangement of simples in the first two books is explained: one has to be acquainted with the basic components—and the theory of how such ingredients would “work”—before the pharmacologist-physician could

<sup>150</sup> Galen, *Bloodletting* 4 (ed. Kühn, XI, 265).

<sup>151</sup> Aetius I *prooemium* (first eighteen lines) (ed. Olivieri [CMG VIII 1], pp. 17–18).

<sup>152</sup> A rare form. Cf. Nicander, *Theriaca* 60.

<sup>153</sup> Ed. Kühn, XII, 4.

<sup>154</sup> Aetius I, 1–418 (ed. Olivieri [CMG VIII 1], pp. 30–146).

<sup>155</sup> Aetius II (ed. Olivieri [CMG VIII 1], pp. 147–255).

<sup>156</sup> Ed. Olivieri (CMG VIII 1), pp. 223–55.

<sup>157</sup> Aetius II, 239 (ed. Olivieri [CMG VIII 1], pp. 237–38).

<sup>158</sup> Aetius II, 240–241 (ed. Olivieri [CMG, VIII 1]), 237–40.

<sup>159</sup> Ed. Olivieri (CMG VIII 1) pp. 256–355.

proceed into prescription of pharmaceuticals by a combined class of action. In Book IV,<sup>160</sup> Aetius takes up formal dietetics, quoting heavily from Galen's *Hygiene*,<sup>161</sup> and one also reads the expected admonitions about exercise and a generally healthy regimen to maintain a healthy body. His earlier discussion of the properties of foods now "fits," as he can suggest which foods would do the best service in the diet, according to the theoretical constructs laid down in Book II, 239–241.<sup>162</sup>

Books V and VI take up diagnostics and the venerated theory of the humors,<sup>163</sup> and some common diseases that can be elucidated through these theories. Only occasional pharmaceuticals appear as they are appropriate to the discussions, but Aetius' major sources have shifted to lengthy quotations from Aretaeus of Cappadocia as well as Galen and Oribasius. Book VII is one of the finest accounts of ophthalmology written in ancient and medieval times,<sup>164</sup> and the discussion is replete with collyria recipes drawn mostly from Galen and Oribasius. Although Aetius does not mention cataract couching, there are clear descriptions of sixty-one eye diseases, showing close acquaintance with the essential anatomical structures.<sup>165</sup> Book VIII is a mixture of materials on inflammations, various plasters, and the like, with many details drawn from Galen's *Compound Drugs Arranged by Place of Ailment*. And although Aetius' complete *Medical Books* are in sixteen books (hence the traditional title of *Tetrabiblon* of the *Biblia iatrika hekkaideka* from the customary division in manuscripts into four *tetrabibloi* to every four *logoi*), one lacks competent modern, well-edited Greek texts,<sup>166</sup> and therefore the pharmacy that teems in the last eight books cannot be accurately assessed. Famous, of course, is Book XVI with its splendid summary of gynecology and obstetrics, but the most often cited Ricci

translation is based on the Cornarius *Latin* translation of 1542,<sup>167</sup> and the most recently edited Greek text suffers from a number of inadequacies.<sup>168</sup>

#### ALEXANDER OF TRALLES

As Aetius of Amida had carefully redacted earlier pharmacology, so also Alexander of Tralles reworked much of the earlier data into a lengthy compendium of suggested treatment of diseases by their symptomatology, explained through a general pathology that assumed a causation of illness from morbid humors. Alexander was born in A.D. 525, and was the son of a physician named Stephen. Our main data for Alexander's family comes from Agathias' *Histories* V, 6.3–6,<sup>169</sup> and Stephen had fathered five sons, all of whom became prominent in their professions: Anthemius, the architect-engineer who designed the magnificent St. Sophia; Olympius, a gifted lawyer; Metrodorus, a pre-eminent grammarian; Dioscurus, a doctor, "... who lived out his life in his native city in which he carried on the practice of medicine with great success;"<sup>170</sup> and Alexander, who "lived in Rome, summoned to hold high position."<sup>171</sup> Agathias implies that Alexander's fame had not reached the ears of Justinian, whereas both Anthemius and Metrodorus were well known to the emperor. After much travel and experience, Alexander settled in Rome and died in A.D. 605.

Of all the Byzantine physicians, Alexander of Tralles has exercised the greatest attraction for modern medical historians, due to his direct experience with the practice of medicine, vividly and frequently recorded in his extant books on various aspects of medical treatment. Two relatively modern translations (in French and German) of Alexander's works have been produced, and both Puschmann and Brunet are impressed by what they perceive as the "strikingly modern" approach by Alexander to medicine and pharmacy.<sup>172</sup> Alexander does represent a sharp contrast to the arid scholasticism of Aetius, but both Oribasius and Paul of Aegina were clearly practicing physicians, and

<sup>160</sup> Ed. Olivieri (CMG VIII 1) pp. 356–408.

<sup>161</sup> E.g., Aetius IV, 1 (ed. Olivieri [CMG VIII 1], pp. 358–59), and Galen, *Hygiene* I, 1 (ed. Koch [n. 109 above], p. 3); and Aetius, IV, 36 (ed. Olivieri, pp. 378–79) and Galen, *Hygiene* III, 3 (ed. Koch, pp. 85–86).

<sup>162</sup> Ed. Olivieri (CMG VIII 1), pp. 237–40.

<sup>163</sup> Ed. Olivieri (CMG VIII 2), pp. 1–249.

<sup>164</sup> Ed. Olivieri (CMG VIII 2), pp. 250–399.

<sup>165</sup> See Emilie Savage-Smith, "Byzantine Ophthalmology" (above in this volume), esp. nn. 61–69.

<sup>166</sup> Barely serviceable "modern" texts of various books of Aetius' *Tetrabibloi* include: G. A. Kostomiris, ed., *Aetiou Logos dōdekatōs* (Bk. XII) (Paris, 1892); S. Zervos, ed., *Aetio Amidenou Logos dekatos kai tritos ē Aetiou Amidenou Peri daknontōn zōōn kai iobolōn* (Bk. XIII) in *Athēna*, 18 (1905), 241–302; and S. Zervos, ed., *Aetiou Amidenou [sic] Logos dekatos pemptos* (Bk. XV) in *Athēna*, 21 (1909), 3–144. Bk. XI is in the Daremberg and Ruelle edition of Rufus, pp. 85–126.

<sup>167</sup> J. V. Ricci, trans., *Aetios of Amida: The Gynaecology and Obstetrics of the VIth Century A.D.* (Philadelphia, 1950).

<sup>168</sup> S. Zervos, ed., *Aetii Sermo sextidecimus et ultimus* (Leipzig, 1901).

<sup>169</sup> R. Keydell, ed., *Agathiae Myrinaei Historiarum* (Berlin, 1967; *CFHB*, II), p. 171.

<sup>170</sup> *Ibid.*

<sup>171</sup> *Ibid.*

<sup>172</sup> Alexander (trans. Brunet), Vol. I. Puschmann, ed., Alexander, I, 75–87, 287–88.



their writings show a sense of the clinic as do those by Alexander. It will not, however, be accurate to describe Alexander of Tralles as a "modern" any more than to designate Galen as such; but Alexander is, indeed, humane and conscientious in his practice, meticulous in his prescriptions, and careful with his command of earlier authorities in medicine. Drugs are scattered throughout Alexander's books, given as recipes for the treatment of specific diseases, usually through the long-lived "treatment by contraries." The occasional complexity of Alexander's drug prescriptions (using 495 different pharmaceuticals) are justified by conflicting symptoms, and many medicinals are recorded as efficacious as verified by personal observation and experience. A critical attitude toward his numerous written sources is characteristic throughout Alexander's works, illustrated by the following, which appears in Book V, 4, "On Viscous Humors and Thick Masses Found in the Lung:"

This is a true statement by Galen on Archigenes:<sup>173</sup> "He was but a man and it would be difficult for him not to make mistakes in many things, being completely ignorant, making bad judgments, and who provided carelessly written accounts." And I would not have said this about such a learned man, unless Truth itself had not inspired me and urged me on, and did I not believe that keeping silent was sinful. For a doctor who does not speak his opinion commits a great sin and through his silence is greatly to be condemned. But one ought to follow that which Aristotle says he has stated: "Plato is my friend, but the Truth is also my friend; between the two, one must choose the Truth."<sup>174</sup>

Alexander does not devote any of his tracts specifically to drugs, but pharmaceutical therapy is very prominent throughout the various subdivisions, for example, fevers, headaches, what we would call "nervous diseases," melancholia, ophthalmology, the rightly famous "Letter on Intestinal Worms," lung diseases, cholera, gout,<sup>175</sup> and so on. Many of the drug recipes seem original, although the particular ingredients have all been used and defined in Greek, Roman, and earlier Byzantine pharmacy. There are occasionally "new names" applied to certain substances, and this can be illustrated by

Alexander's "Armenian Stone," which is part of a recipe in *On Fevers* VII [Quartans] (Puschmann, I, 429). Earlier Greek sources—including the *Papyri Graecae Magicae* XII, 201—had noted the use of *ios chalkou* ("verdigris," or copper oxyacetate, approximately  $[C_2H_3O_2]_2Cu \cdot Cu[OH]_2 \cdot 5H_2O$ ), but Alexander's *Armeniakos lithos* has taken the place of *ios chalkou*. This "new" substance had been foreshadowed in Dioscorides, *Materia medica* V, 90, and if we understand the geological chemistry the "Armenian Stone" is a combination of copper oxyacetate, azurite ( $2CuCO_3 \cdot Cu[OH]_2$ ), and malachite ( $CuCO_3 \cdot Cu[OH]_2$ ).<sup>176</sup> Roman and Byzantine pharmacy could substitute one "kind" of copper oxyacetate for another, and it is probable that Alexander knew the "Armenian Stone" in the same role as had been played by verdigris in earlier prescriptions. The remainder of the recipe "On the Armenian Stone" suggests that Alexander's "new" pharmacy consisted of rearrangement of ingredients according to his experience:

The stone, which is called "The Armenian," given washed or unwashed in a dosage of 4 *keratia* [c. 800 mg./12 grains] works well for all forms of quartan fever, since it [performs] as no other for the evacuation of black bile. Washed in water, it completely purges the lower bowels, but unwashed it is an emetic which does not cause too much heating, unlike the others. But if some [of your patients] regard the solution of "the stone" with disgust, make little pills using the following ingredients:

- 4 *grammata* [c. 4.6 grams/4 scruples/80 grains] of *pi-kras* [an aloe-honey mixture]<sup>177</sup>
- 3 *grammata* [c. 3.5 grams/3 scruples/60 grains] of *epithymon* [lesser dodder, *Cuscuta epithymum* (L.) Murr.]<sup>178</sup>
- 1 *gramma* [c. 1.2 grams/1 scruple/20 grains] of *agarikon* [prob. a tree mushroom of *Boletus* spp.]<sup>179</sup>
- 1 *gramma* of *Armeniakos lithos*
- 5 "berries" of *karyophylla* [cloves, *Eugenia caryophyllata* Thunb.; here the sun-dried, unopened flower-buds]<sup>180</sup>
- 5 *grammata* [c. 5.9 grams/5 scruples] of *skammōnia* [scammony, *Convolvulus scammonia* L.]<sup>181</sup>

<sup>176</sup> Cf. D. Goltz, *Studien zur Geschichte der Mineralnamen in Pharmazie, Chemie und Medizin von den Anfängen bis Paracelsus* (Wiesbaden, 1972; SA Beiheft 14), 146–47.

<sup>177</sup> Juvenal VI, 180, and Galen, *Hygiene* VI, 10.19 (ed. Koch [n. 109 above], p. 188).

<sup>178</sup> Dioscorides IV, 177 (ed. Wellmann, II, pp. 326–27). Galen, *Hygiene* VI, 7.18 (ed. Koch [n. 109 above], p. 182).

<sup>179</sup> Maggiulli, *Nomenclatura* (n. 55 above), 85–88.

<sup>180</sup> Paul of Aegina VII, 3 (ed. Heiberg, II, 211). A. F. Hill, *Economic Botany*, 2nd ed. (New York, 1952), 445–46. J. W. Purseglove, E. G. Brown, C. L. Green, and S. R. J. Robbins, *Spices* (London, 1981; 2 vols.), I, 237 ("fruits").

<sup>181</sup> Theophrastus, *HP* IV, 5.1, and IX, 1.3. Nicander, *Alexipharmaca* 565. Dioscorides IV, 170 (ed. Wellmann, II, 318–19).

<sup>173</sup> More-or-less Galen, *Drugs by Location* II, 1 (ed. Kühn, XII, 535).

<sup>174</sup> Alexander (ed. Puschmann), II, p. 155; French trans. by Brunet, III, 124–25.

<sup>175</sup> Alexander (ed. Puschmann), I, 290–439 (fevers; in 7 books); I, 465–507 (headaches); phrenitis, lethargy, epilepsy, etc. (I, 508–91); melancholia (I, 591–612); ophthalmology (II, 2–70); intestinal worms (II, 586–600); lung diseases (II, 146–244); cholera (II, 320–34); gout (II, 500–86).

Mix with juice of *kitrion* (citron, *Citrus medica* L.),<sup>182</sup> or with *krokomēlon* (a jam made from quince [*Cydonia oblonga* Mill.] and saffron [*Crocus sativus* L.]), or with *rhodomēlon* (a jam made from roses [*Rosa gallica* L.] and quince),<sup>183</sup> or with *rhodomeli* (rose-honey mixture). The dose is 2 *grammata* [c. 2.4 grams/2 scruples/40 grains].<sup>184</sup>

It is significant that an alchemical papyrus from late Roman or Byzantine Egypt also has the combination of water and verdigris,<sup>185</sup> so that Alexander has recorded a common association of “washing” the “green rust” that is copper oxyacetate. The remaining substances in the recipe are known from earlier Greco-Roman sources, and even though the cloves appear exotic, they were known in Roman pharmacy in the first century,<sup>186</sup> but with the close links in the traditions between Cosmas Indicopleustes and Alexander,<sup>187</sup> it seems that this peculiar *hapax legomenon* may reflect a special connection with the spice trade from the Far East. The text of Alexander, *On Fevers* VII [Quartans] (Puschmann, I, 429 and 431) shows a careful assessment of drugs in the context of the ancient humoral pathology, and it appears that this recipe—and many others by Alexander—was compounded after a lengthy experience with patients who exhibited quartan fever. Alexander’s pharmacy indicates that Byzantine drug lore was anything but repetitive and static: it shows a continual attempt by the best of the early Byzantine physicians to utilize the traditional pharmacopoeia in new patterns, while retaining the theoretical context of Hippocratic and Galenic medical theory.

#### THEOPHILUS PROTOSPATHARIUS AND PAUL OF AEGINA

Before considering the lucid summary of pharmacology by Paul of Aegina (*fl.* in the 640s in Alexandria),<sup>188</sup> the works of Theophilus Protospatharius should be mentioned. Although there has been debate concerning the century in which Theophilus practiced medicine,<sup>189</sup> the dating by

Krumbacher seems to have stood up to scrutiny; we may thus continue to assume that Theophilus lived during the reign of Heraclius (A.D. 610–641). Whenever one dates Theophilus, there can be little doubt about his masterful conglomeration of the ancient medical classics with the Byzantine Christian outlook, nicely exemplified by his *On the Structure of the Human Body*,<sup>190</sup> which fuses Galen’s demiurge and teleology in *Use of Parts* with a continually emphasized *ho demiourgos theos hēmōn*.<sup>191</sup> Of interest for Byzantine pharmacy is the short fragment of Theophilus’ *On Excrements*,<sup>192</sup> indicating a continued use of dungs in medicinals. And of fundamental interest in the fresh approaches of Byzantine medical practice and diagnosis is Theophilus’ *On Urines*,<sup>193</sup> which became the probable ancestor of so many Byzantine works on the topic.

The seventh of Paul’s *Seven Books* is devoted solely to drugs and pharmaceuticals and represents a culmination of the Greek, Roman, and early Byzantine search for clarity in drug lore. In the first six books, Paul does indeed give a great number of prescriptions as treatments for diseases, but in the seventh, he gathers all of the 600 plants and 80 non-botanical ingredients into a crisply clear alphabetical catalogue. First, he pens a precisely worded introduction to drug theory, adapted from Oribasius and Aetius:

On the Mixtures [*kraseis*] of Substances as Indicated by Their Tastes. It is not adequate to judge from the smell concerning the *krasis* of things perceived by the senses. Substances without odors are made up of large particles, but it is not clear whether they are hot or cold. And things which do have an odor, to a certain extent, are made up of small particles and are hot. But the degree of the smallness of their parts, or of their heat, is not apparent, because of the inequality of their substance. And still more uncertain it is to judge them according to their colors, since with every color are found hot, cold, drying, and wetting substances. In tasting, however, all parts of the substances undergoing tasting come into contact with the tongue and stimulate the sense of taste, and thus one can judge clearly their properties in their *kraseis*. Astringents, therefore, contract, obstruct, condense, dispel, and thicken; and added to all of these properties, they are cold and drying. That which is acidic cuts, divides, thins, removes obstructions, and cleans without making heat; but that which is acrid is like the acidic in being thinning and purging, but it differs from it: the acidic is cold, and the acrid is hot; moreover, the acidic repels, but the acrid attracts, consumes, dissolves, and promotes scab [or scar] formation. Similarly, that which is

<sup>182</sup> Dioscorides I, 115.5 (ed. Wellmann, I, 109). Galen, *Simples* VII, 12.19 (ed. Kühn, XII, 77).

<sup>183</sup> Cf. Alexander (ed. Puschmann), I, 479, 503, 523, 613, and II, 371, 495, 567 [further reffs. to the rose-quince jam]; and cf. Alexander, I, 327, 383, 415, 613, and II, 61, 275, 371, 591, 593 [further reffs. to rose-honey].

<sup>184</sup> Alexander (ed. Puschmann), I, 429 and 431 (Greek text).

<sup>185</sup> PGM, XII, 193–201.

<sup>186</sup> Pliny, *Natural History* XII, 30.

<sup>187</sup> The “Cosmas,” to whom the *Fevers* is dedicated (Puschmann, I, 289) is probably Cosmas Indicopleustes, whose father was an early medical teacher of Alexander (Puschmann, I, 83, following Meyer, *Botanik*, II, 384).

<sup>188</sup> Hunger, “Medizin,” 302.

<sup>189</sup> *Ibid.*, 299.

<sup>190</sup> Ed. Greenhill.

<sup>191</sup> Hunger, “Medizin,” 299.

<sup>192</sup> Ideler, I, 397–408.

<sup>193</sup> Ideler, I, 261–83.

bitter cleans the pores, is cleansing and thinning, and cuts the thick humors without any heat perceived by the senses. What is wet is cold, thick, and promotes condensation, contraction, blockage, necrosis, and torpidity. By contrast a salty substance contracts, strengthens, preserves as in pickling, and dries without detectable heat or coldness. What is sweet relaxes, "cooks" [viz. promotes "coction"], softens, and lessens density; and what is oily moistens, softens, and relaxes.<sup>194</sup>

On the Orders and Degrees of the *Kraseis* [adapted from Oribasius and Aetius]. A moderate drug is of the same *krasis* as that to which it is applied, so that it does not dry, moisten, cool, or heat, and it should not be called dry, wet, cold, or hot. But that which is drier, moister, hotter, or colder, is thereby known from its dominant property [*dynamis*]. It will be satisfactory to make—for practical use—four orders [*taxeis*] according to the dominant property, naming the substance hot as appropriate to the first order, when it would heat indistinctly and it would require reason to demonstrate its property; likewise this would be true for the cold, dry, and wet, when the dominant property requires reason to demonstrate its existence, and it has no strong or apparent property as perceived by the senses. And such substances as are clearly those having drying, wetting, heating, and cooling properties may be said to be in the second order. Such substances which have these properties, but not to an extreme degree even though they are strong, may be said to be in the third order, but such substances as those which are hot enough to cause scarring or burning are in the fourth order. Similarly, such substances as those which are so cold as to cause necrosis are also in the fourth order. Nothing, however, is found drying in the fourth order that does not burn: for that which dries to an extreme degree [*akrōs*] also always burns, for example, chalcopyrite [prob.  $\text{CuFeS}_2$ ],<sup>195</sup> rock alum [a ferrous sulfate],<sup>196</sup> and quicklime [ $\text{CaO}$ ].<sup>197</sup> But a substance may be in the third order of dessicants without being caustic, such as those substances which are sharply astringent, e.g. the juice of unripe grapes, sumac [*Rhus coriaria* L.],<sup>198</sup> and alum [prob. a potash alum:  $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ ].<sup>199</sup>

Comparing this concise summary with the attempts by Galen to bring some sort of order and clarity into the chaos of drug lore delineates the Byzantine ability in choosing essentials and explicating them with great precision. Galen had posed

questions and—having rejected the brilliant "drugs-by-affinity" system of Dioscorides—attempted an ordering for pharmaceuticals; but Galen had failed to provide a satisfactory method, even though he perceived three separate approaches evinced in his *Simples*, *Drugs by Location*, and *Drugs by Kind*. Oribasius had excerpted much of Galen, and had shown a method of extraction of drug theory.<sup>200</sup> Aetius of Amida had further refined the attempts by Galen to comprehend medicinals by a "system of degrees," but even though there is a judicious care in the lengthy preface on drugs and drug lore in Aetius, *Medical Books I*, there remains a muddled character and a somewhat jagged result from the painstaking juxtaposition of the carefully chosen extracts of Galen's drug theory. Alexander knows his Galen, but chooses to concentrate on the practical aspects of drug lore, so that one does not find a specific "book" on pharmaceuticals either in Alexander's separate tracts on fevers, or in his extant *Twelve Books on Medicine*: the theory of drugs is embedded in the recipes recorded. Paul's distillation of classical drug theory has finally captured the essence, and it has the characteristics of filtration and the reworked theory seen earlier in Oribasius and Aetius. Paul is also deeply learned in the medical classics, but his compilation bears the marks of an age skilled in ensuring that adaptation accompanied a creative synthesis borne of direct clinical experience combined with venerated assumptions applied to the "modern" age of Heraclius and the Arab invasions of Egypt, Palestine, Syria, and beyond. In the broader historical and cultural context, the early Byzantine physicians should be viewed as part of the same tendencies which produced the brilliant compactions of Roman law from the *Codex* of Theodosius through the *Institutes*, *Digest*, and *Novella* of Justinian.

#### APPENDIX: THE PAPYRI AND BYZANTINE MEDICINE ON MULTI-INGREDIENT INCENSE.

##### KYPHI AND KRISMA

Among several hundred medicinals mentioned in the collection of Greek and Coptic papyri known as the *Papyri Graecae Magicae*,<sup>201</sup> occur the names

<sup>194</sup> Paul of Aegina VII, 1 (ed. Heiberg, II, p. 185).

<sup>195</sup> Dioscorides V, 74 and 100. *PGM*, XII, 195 and 399. Goltz (n. 176 above), 156–57 (μίσυ).

<sup>196</sup> Χαλκίτης most often  $\text{Fe}_4(\text{OH})_2(\text{SO}_4)_5 \cdot 18\text{H}_2\text{O}$ , as in the χαλκίτης στυπτηρίη of the Hippocratic *Wounds* 14 (ed. Littré, VI, p. 416); ἄνθος αἰγυπτίη χαλχοῦ ὀπτὸν, στυπτηρίη αἰγυπτίη ὀπτή. Dioscorides V, 99. Goltz (n. 174 above), 154–55.

<sup>197</sup> Here τίτανος, as contrasted to the usual ἄσβεστος. Goltz (n. 176 above), 171.

<sup>198</sup> Theophrastus, *HP* III, 18.3. Dioscorides I, 108 (ed. Wellmann, I, pp. 101–2).

<sup>199</sup> Here the common στυπτηρία, as in Aristotle, *Historia Animalium* 547a20.

<sup>200</sup> E.g., Oribasius, *Medical Collection* XIV, 5 and 11 (ed. Raeder, II, 185–86 and 193), extracted from Galen, *Simples* I, 38, and V, 26–27 (ed. Kühn, XI, 450–51, and 785–87). Behind Oribasius, *Medical Collection* XIV, 5.1–2 (ed. Raeder, II, 185)—as quoted by Galen—are Plato, *Timaeus* 65B–66C, and Theophrastus, *De causis plantarum* VI, 4.1.

<sup>201</sup> My "count" is 425 different herbs, minerals, insects, dungs, etc. An English translation of the entire *PGM*, with commentar-

of two kinds of multi-ingredient incense, *kyphi* and *krisma*.<sup>202</sup> The anonymous writers apparently presume that their readers would know the ingredients for these two incenses, much as they have assumed a knowledge of the numerous medicinal plants, insects, minerals, and other animals employed in a curious mixture of rational and irrational medical-cum-magical prescriptions.<sup>203</sup> These papyri generally emerge from late Roman and Byzantine Egypt, and one may be sceptical of claims that Greek medicine had made its way into the everyday traditions of the native Egyptians, but it also must be recalled that a common knowledge of plants and animals among ancient peoples would be "taken for granted,"<sup>204</sup> a factor often ignored by modern scholars, who presume a constant specialized expertise, analogous to modern medicine and pharmacy. The magical papyri, however, afford a rare glimpse into the actual "medicine of the masses" (at least in Roman and Byzantine Egypt), and this medicine has great affinity to the religious/magical medicine explicated by Gary Vikan in this collection of essays.<sup>205</sup> If, however, the "upper class" pharmaceutical sources had not recorded the exact names of plants and herbs,<sup>206</sup> one would be reduced to learned speculation concerning ingredients, particularly in the cases of drugs compounded from a number of substances. *Kyphi* and *krisma* show a sophistication of both compounding drugs among the so-called common folk, and they also indicate a developing history of their own, destroying the accepted mythology of modern medical historians that ancient medicine developed to a certain point, and then remained utterly static for countless centuries. By contrast to this assumption, the Greek texts show that Egyptian priest-physicians—and their non-Egyptian Greek, Roman, and Byzantine medical counterparts—were in a continual process of "improving the product." One is able to trace *kyphi* from the first century through the mid seventh century, and the mentionings in the magical papyri indicate that such compounds were available far beyond the urban centers of the Roman and Byzantine Empires.

ies, will shortly appear (ed. H. D. Betz, and a team of a dozen scholars), to be published by the University of Chicago Press.

<sup>202</sup> PGM, IV, 1313–14, 2971; V, 221; VII, 538, 873.

<sup>203</sup> Paralleled in the Greek texts known as the *Cyranides*. Dimitris Kaimakis, ed., *Die Kyraniden* (Meisenheim am Glan, 1976).

<sup>204</sup> G. E. R. Lloyd, *Science, Folklore and Ideology* (Cambridge, 1983), 119–35.

<sup>205</sup> See G. Vikan, "Art, Medicine and Magic in Early Byzantium" above in this collection of essays.

<sup>206</sup> Esp. Theophrastus in *HP* and *De causis plantarum*, and Dioscorides in his *Materia medica*.

Dioscorides is well acquainted with Egypt, and his *Materia medica* has the first Greek record of *kyphi*, a multi-ingredient incense that not only was to be burned for its heavy and pungently aromatic odor, but which also was an effective medicinal salve—one could even eat it for presumed benefits. Dioscorides writes that in the Egypt of his day (the mid first century) there were many formulas for *kyphi*, and that he is setting down only one of them (*Materia medica* I, 25 [Wellmann, I, pp. 28–29]), and he lists ten ingredients with measures: ½ *xestēs* [c. ½ pint] of nut grass [*kyperos*: *Cyperus rotundus* L.]; ½ *xestēs* of ripe juniper berries [*Juniperus communis* L.]; 12 *minae* [c. 11 lbs.] of raisins, "the seeds having been removed"; 5 *minae* [c. 4.5 lbs.] of purified pine resin [*rhētīnē apokekatharmenēs*]; 1 *mina* [c. 15 oz.] of sweet flag [*kalamos arōmatikos*: *Acorus calamus* L.]; 1 *mina* of camel's thorn (oil) [*aspalathos*: *Alhagi camelorum* Fisch.]; 1 *mina* of camel grass (oil) [*schoinos*: *Cymbopogon schoenanthus* Spreng.]; 12 *drachmai* [c. ¾ lb.] of myrrh [*smyrna*: *Commiphora* spp.]; 9 *xestai* [c. 9 pints] of old wine; and honey as part of the preparation instructions, viz.:

Having removed the seeds from the raisins, pound and triturate them with the wine and the myrrh, and having pounded and sifted the rest of the ingredients, combine them all to soak for one day; then, having boiled the honey until it has a glutinous consistency, mix it carefully with the melted pine resin, and then having carefully pounded together the rest of the ingredients, put up for storage [this incense] in an earthenware vessel.<sup>207</sup>

Dioscorides does not say if other *kyphi* recipes in his time were more complicated, or if they had more ingredients, but Plutarch, *Isis and Osiris* 383E(80)–384C lists a *kyphi* formula with sixteen ingredients. Ten are the same as in Dioscorides' recipe (honey, wine, raisins, nut grass, pine resin, myrrh, camel's thorn oil, two sizes [large and small] of juniper berries, and sweet flag), but Plutarch's list adds six more ingredients: hartwort (*seselis*: *Tordylium officinale* L.), mastic (*schinos*: *Pistacia lentiscus* L.), Dead Sea bitumen (*asphaltos*: C<sub>n</sub>H<sub>2n</sub>O<sub>n</sub> + V, Ni, Mo [traces]), rush (*thryon*: *Juncus glaucus* Sibth.), spinach dock (*lapathon*: *Rumex patientia* L.), and cardamon (*kardamōmon*: *Elettaria cardamomum* [L.] Maton.). Unlike a similar recipe, reduced to a medical poem by Democrates,<sup>208</sup> Plutarch provides no measures, nor does he give any instructions for the preparation of the *kyphi*. He simply writes that "the ingredients

<sup>207</sup> Dioscorides I, 25 (ed. Wellmann, I, pp. 28–29).

<sup>208</sup> Democrates in Galen, *Antidotes* II, 2 (ed. Kühn, XIV, 117–19).

are not compounded haphazardly, but whenever the drug-preparers [*myrepsoi*] are mixing these substances, sacred writings are read to them.”<sup>209</sup> Since the *Suda* mentions a work by Manetho called *Preparation of Kyphi-Recipes*,<sup>210</sup> Plutarch probably gained his listing of the sixteen ingredients from this lost book,<sup>211</sup> which suggests that Dioscorides’ first-century *kyphi* recipe represented a pared-down version of earlier Ptolemaic Egyptian listings for *kyphi*, in turn derived from very ancient Egyptian origins.<sup>212</sup> “They use *kyphi* in both drinks and ointments,”<sup>213</sup> so Plutarch says, and even though he gives some farfetched speculation on why this incense should have been so valued as a drug, Plutarch has recorded an important detail: *kyphi* was commonly consumed in a drink.

Paul of Aegina III, 28.2 (ed. Heiberg, I, p. 206) mentions a *kyphi*, called “the lunar” (*kyphi selēniakon*), which is termed *chrisma selaniakon* in the papyrus.<sup>214</sup> Paul writes that, in addition to being used to give a pleasant (if heavy) odor, it is to be rubbed into the forehead as a salve. Oribasius had recorded a formula for a “lunar *kyphi*” with twenty-five ingredients,<sup>215</sup> while Paul’s detailed recipe for the “lunar incense-salve” has twenty-eight ingredients.<sup>216</sup> Some of the ingredients overlap with those given by Dioscorides and Plutarch quoting Manetho, and the anonymous authors of the magical papyri indicate that by the fourth century, some *kyphi* recipes had become known by the more specific *chrismata*, perhaps to suggest their medical use as oily unguents and incenses, but not as drinks or an “edible” drug.<sup>217</sup> Yet the compiler of the papyrus can assume his reader would “know” the ingredients of this complicated incense-salve, and Oribasius and Paul seem to presume an equivalence of *kyphi* with *krisma*, which may indicate that the *kyphi* label had, indeed, become the more “Hellenic” *krisma* outside Egypt. The function, how-

ever, of the late Roman and early Byzantine *kyphi-chrismata* generally followed the hallowed Egyptian pattern, while adding an ever more impressive array of ingredients, exotic and local. Paul III, 28.2, is illustrative:

Another incense-salve of 28 ingredients, called “the lunar”

7 *ounkiai* [c. 191 grams] of *bdellion*: bdellium, either the aromatic gum of the Haddi tree, or, the bdellium of the Mukul “myrrh” tree (*Commiphora erythraea* Engl. var. *glabrescens* Engl., or, *C. mukul* Engl.)

7 *ounkiai* of *helenion*: either calamint [= basil thyme], or elecampane [= horseheal] (either *Satureja calamintha* [L.] Scheele, or *Inula helenium* L.)

2 *ounkiai* [c. 55 grams] of *schoinos*: camel grass (*Cymbopogon schoenanthus* Spreng.)

5 *ounkiai* [c. 136 grams] of *sphagnos*: horehound [= false dittany] (*Ballota acetabulosa* [L.] Benthham)

50 small juniper berries (*arkeuthides mikrai*): *Juniperus communis* L.

5 *ounkiai* of *kardamōmon*: cardamon (*Elettaria cardamomum* [L.] Maton.)

7 *ounkiai* of *aspalathos*: camel’s thorn oil (*Alhagi mauro-rum* Medik.)

5 *ounkiai* of *kassia syrinx*: cassia “quill” (*Cinnamomum cassia* Blume.)

2 *ounkiai* of *nardostachys*: spikenard oil (*Nardostachys jatamansi* DC)

5 *ounkiai* of *kyperos*: nut grass (*Cyperus rotundus* L.)

4 *ounkiai* [c. 109 grams] of *asphodelos rhiza*: asphodel root (*Asphodelus ramosus* L.)

4 *ounkiai* of *brathu*: savin (*Juniperus sabina* L.)

3 *ounkiai* of *kyparissos (sperma)*: cypress seeds (*Cupressus sempervirens* L.)

3 *ounkiai*. [c. 82 grams] of *nardos Keltikē*: valerian (*Valeriana celtica* L.)

3 *ounkiai* of *malabathron (meta tōn phyllōn)*: Indian cassia + leaves (*Cinnamomum tamala* [Buch.-Ham] Nees. & Eberm.)

3 *ounkiai* of *rhoda xēra*: dried roses (prob. *Rosa gallica* L.)

2 *ounkiai* of *kostos*: costus (*Saussurea lappa* C. B. Clarke)

2 *ounkiai* of *krokos*: saffron crocus (*Crocus sativus* L.)

7 *ounkiai* of *ladanon*: gum labdanum (*Cistus ladaniferus* L.)

7 *ounkiai* of *symrna*: myrrh (*Commiphora myrrha* [Nees.] Engl.)

2 *litrai* [c. 655 grams] of *staphis (enkigartistheisos)*: pitted, dried grapes = raisins (prob. *Vitis vinifera* L.)

2 *litrai* of *ischas liparos*: dried, fat figs (*Ficus carica* L.)

8 *ounkiai* of *strobilos*: kernels of the stone pine (prob. *Pineus pinea* L.)

1 *litra* [c. 327 grams] of *terebinthinē*: Chian turpentine from terebinth (*Pistacia terebinthus* L.)

7 *ounkiai* of *styrax*: storax gum (*Styrax officinalis* L.)

1 *litra* of *phoinikoi liparoi*: dates of the date palm (*Phoenix dactylifera* L.)

5 *litrai* of *meli*: honey [c. one and two-thirds kilograms] *oinos euōdes to akroun*: fragrant wine as is sufficient

Oribasius’ “lunar salve” has almost all of the same ingredients and measures as seen here in Paul’s

<sup>209</sup> Plutarch, *Moralia: Isis and Osiris* 383E(80).

<sup>210</sup> *Suda*, M no. 142 (ed. Adler, Vol. III, p. 318).

<sup>211</sup> Thus this is Frg. no. 87 in W. G. Waddell, ed. and trans., *Manetho* (Cambridge, Mass., 1940 [Loeb: in vol. *Manetho. Ptolemy: Tetrabiblos*], pp. 202–5).

<sup>212</sup> G. Ebers, “Ein Kyphirecept aus dem Papyros Ebers,” *Zeitschrift für ägyptische Sprache und Altertumskunde*, 12 (1874), 106–11. Further reffs. in J. G. Griffiths, ed., with trans. and comm., *Plutarch’s De Iside et Osiride* (Cambridge [for Univ. Wales Press], 1970), 569 n. 4.

<sup>213</sup> Plutarch, *Moralia: Isis and Osiris* 384B(80): τῷ δὲ κύφῳ χρῶνται καὶ πόματι καὶ χρίματι.

<sup>214</sup> *PGM*, VII, 873.

<sup>215</sup> Oribasius, *Synopsis for Eustathius* III, 220 (ed. Raeder, p. 121).

<sup>216</sup> Paul of Aegina VII, 22.5 (ed. Heiberg, II, p. 394).

<sup>217</sup> Cf. Galen, *Hygiene* VI, 4.6 (ed. Koch [n. 109 above], p. 177).

recipe: Paul has added only the gum labdanum, saffron crocus, and the Indian cassia. One can presume that once mixed, this salve-incense would be doled out carefully and would have lasted for several months.

Paul VII, 22.1 (ed. Heiberg, II, p. 393) makes it clear that early Byzantine pharmacy placed the *kyphi* among perfumes, but he also tells us that the aromatic function is a minor one for especially the *kyphi*: one uses them as drugs, to be taken internally for the production of accumulation of mucus, and as preventative measures during times of epidemics, as well as for freeing up the lungs and for liver ailments caused by cold. Following are four recipes: perfume of roses, perfume of lilies, the "Great *Kyphi*, called "The Solar" (36 ingredients), and the 28-ingredient "lunar *kyphi*" given above in

detail. Dioscorides had been one of the first Greco-Roman physicians to recognize the usefulness of the traditional Egyptian multi-ingredient incense recipes, and the *kyphi/krismata* soon occupied an important place in Roman pharmacy, as evinced by Damocrates' poem as quoted by Galen. And Paul, in the seventh century, probably indicates why these curious, quasi-folkloric incenses should have been regarded as very useful by formal pharmaceutics: *kyphi* occupied a place between drugs prepared as lozenges to be dissolved in the mouth, and those drugs thought to be true antidotes.<sup>218</sup>

University of Kentucky

<sup>218</sup> Paul of Aegina VII, 22.1 (ed. Heiberg, II, p. 393).